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PC WORLD

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7 HOME-OFFICE ATs
Power for the Office, Support for Home

HIGH-SPEED MODEMS
5 Hot Compatibles Blaze at 9600 bps

ALSO

10 Jumbo Hard Drives

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SO HOW COME YOU NEVER CALL?

PC MAGAZINE EDITOR'S CHOICE

"The new top-of-the-line Dell System 325 is a flagship worth putting out in front of the fleet."

February 14, 1989

THE DELL SYSTEM® 310
20 MHz 386.

The best combination of performance and value available in its class.

STANDARD FEATURES:

- Intel 80386 microprocessor running at 20 MHz.
- Choice of 1 MB, 2 MB, or 4 MB of RAM* expandable to 16 MB (using a dedicated high-speed 32-bit memory slot).
- Advanced Intel 82385 Cache Memory Controller with 32 KB of high speed static RAM cache.
- Page mode interleaved memory architecture.
- VGA systems include a high performance 16-bit video adapter.
- Socket for 20 MHz Intel 80387 or 20 MHz WEITEK 3167 math coprocessor.
- 5.25" 1.2 MB or 3.5" 1.44 MB diskette drive.
- Dual diskette and hard drive controller.
- Enhanced 101-key keyboard.
- 1 parallel and 2 serial ports.
- 200-watt power supply.
- 8 industry standard expansion slots (6 available).

***Lease for as low as $131/month.*
△ Extended Service Plan pricing starts at $251.

40 MB TTL Monochrome System	$3,599
40 MB VGA Color Plus System	$4,099
100 MB VGA Color Plus System	$4,699
100 MB Super VGA Color System (800x600)	$4,799

Prices listed reflect 1 MB of RAM. 150 and 322 MB hard drive configurations also available.

**Performance Enhancements (Systems 325, 310, and 316): within the first megabyte of memory, 384 KB of memory is reserved for use by the system to enhance performance. 4 MB configurations available on all systems. Call for pricing.*

THE DELL SYSTEM® 316
16 MHz 386SX.™

Expandable, affordable access to 386 architecture.

STANDARD FEATURES:

- Intel 80386SX microprocessor running at 16 MHz.
- Choice of 1 MB, 2 MB, or 4 MB of RAM* expandable to 16 MB (8 MB on the system board).
- Page mode interleaved memory architecture.
- VGA systems include a high performance 16-bit video adapter.
- LIM 4.0 support for memory over 1 MB.
- Socket for 16 MHz Intel 80387SX math coprocessor.
- 5.25" 1.2 MB or 3.5" 1.44 MB diskette drive.
- Integrated high performance hard disk drive interface and diskette controller on system board. (ESDI based systems include a hard disk controller.)
- Enhanced 101-key keyboard.
- 1 parallel and 2 serial ports.
- 200-watt power supply.
- 8 industry standard expansion slots (7 available).

***Lease for as low as $98/month.*
△ Extended Service Plan pricing starts at $234.

40 MB TTL Monochrome System	$2,699
40 MB VGA Color Plus System	$3,199
100 MB VGA Color Plus System	$3,799
100 MB Super VGA Color System (800x600)	$3,899

Prices listed reflect 1 MB of RAM. 150 and 322 MB hard drive configurations also available.

THE NEW DELL SYSTEM® 210 NETSTATION 12.5 MHz 286.

Its price, performance and expandability make it an ideal choice as a network workstation.

STANDARD FEATURES:

- 80286 microprocessor running at 12.5 MHz.
- Choice of 640 KB, 1 MB or 2 MB of RAM expandable to 16 MB (6 MB on system board).
- Network interface card.
- LIM 4.0 support for memory over 640 KB.
- Integrated diskette and high performance 16-bit VGA video controller on system board.
- Socket for Intel 80287 math coprocessor.
- 5.25" 1.2 MB or 3.5" 1.44 MB diskette drive.
- Integrated high performance hard disk interface on system board.
- Enhanced 101-key keyboard.
- 1 parallel and 2 serial ports.
- 3 full-sized 16-bit AT expansion slots available.

***Lease for as low as $61/month.*
△ Extended Service Plan pricing starts at $180.

Diskless with Ethercard Plus and PROM	$1,609
Single Diskette Drive and Ethercard Plus	$1,678
20 MB hard disk with Diskette Drive and Ethercard Plus	$1,978

Prices above reflect 640K of RAM. 40 MB and 100 MB hard disk configurations also available.

3COM's Etherlink II and Tokenlink cards also available for netstation configurations. Please call for pricing.

THE NEW DELL SYSTEM® 210 12.5 MHz 286.

The price says this is an entry-level system. The performance says it's a lot more.

STANDARD FEATURES:

- 80286 microprocessor running at 12.5 MHz.
- Choice of 512 KB, 640 KB,†† 1 MB, or 2 MB of RAM expandable to 16 MB (6 MB on system board).
- Page mode interleaved memory architecture.
- LIM 4.0 support for memory over 640 KB.
- Integrated diskette and high performance 16-bit VGA video controller on system board.
- Socket for Intel 80287 math coprocessor.
- 5.25" 1.2 MB or 3.5" 1.44 MB diskette drive.
- Integrated high performance hard disk interface on system board.
- Enhanced 101-key keyboard.
- 1 parallel and 2 serial ports.
- 3 full-sized 16-bit AT expansion slots available.

***Lease for as low as $64/month.*
△ Extended Service Plan pricing starts at $190.

20 MB VGA Monochrome System	$1,699
20 MB VGA Color Plus System	$1,999
40 MB VGA Monochrome System	$1,899
40 MB VGA Color Plus System	$2,199

Prices listed reflect 512 KB of RAM. **††640 KB versions of the above systems are available for an additional $80.** 100 MB hard drive configurations also available.

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SAVE NOW ON THE DELL SYSTEM® 325 25 MHz 386.

AN EVEN BETTER VALUE AT THESE NEW LOW PRICES.

STANDARD FEATURES:

- Intel 80386 microprocessor running at 25 MHz.
- Choice of 1 MB, 2 MB, or 4 MB of RAM* expandable to 16 MB (using a dedicated high-speed 32-bit memory slot).
- Advanced Intel 82385 Cache Memory Controller with 32 KB of high speed static RAM cache.
- Page mode interleaved memory architecture.
- VGA systems include a high performance 16-bit video adapter.
- Socket for 25 MHz Intel 80387 or 25 MHz WEITEK 3167 math coprocessor.
- 5.25" 1.2 MB or 3.5" 1.44 MB diskette drive.
- Dual diskette and hard drive controller.
- Enhanced 101-key keyboard.
- 1 parallel and 2 serial ports.
- 200-watt power supply.
- 8 industry standard expansion slots (6 available).

***Lease for as low as $153/month.*
△ Extended Service Plan pricing starts at $370.

40 MB VGA Monochrome System	$4,199
100 MB VGA Color Plus System	$5,099
100 MB Super VGA Color System (800x600)	$5,199
150 MB Super VGA Color System (800x600)	$5,699

Prices listed reflect 1 MB of RAM. 322 MB hard drive configurations also available.

All systems are photographed with optional extras.

AD CODE NO. 11DM9

Technically speaking, the Dell System® 325 is one of the most advanced 386™ computers available. And, according to PC Magazine, it's one of the most advanced 386 computers they've ever tested.

In benchmark after benchmark, the 25 MHz Dell System 325 ran circles around a field of 386-based systems. A field that included the Compaq^ 386/25.

A show of prowess that earned the System 325 PC Magazine's Editor's Choice award.

It was a goal we set for ourselves from the very beginning. And an objective anyone with a penchant for power and performance can appreciate.

THE FIRST PERSONAL COMPUTER THAT'S REALLY PERSONAL.

Of the more than 150,000 personal computers we've sold to date, each one has been individually configured to fit the needs of its owner.

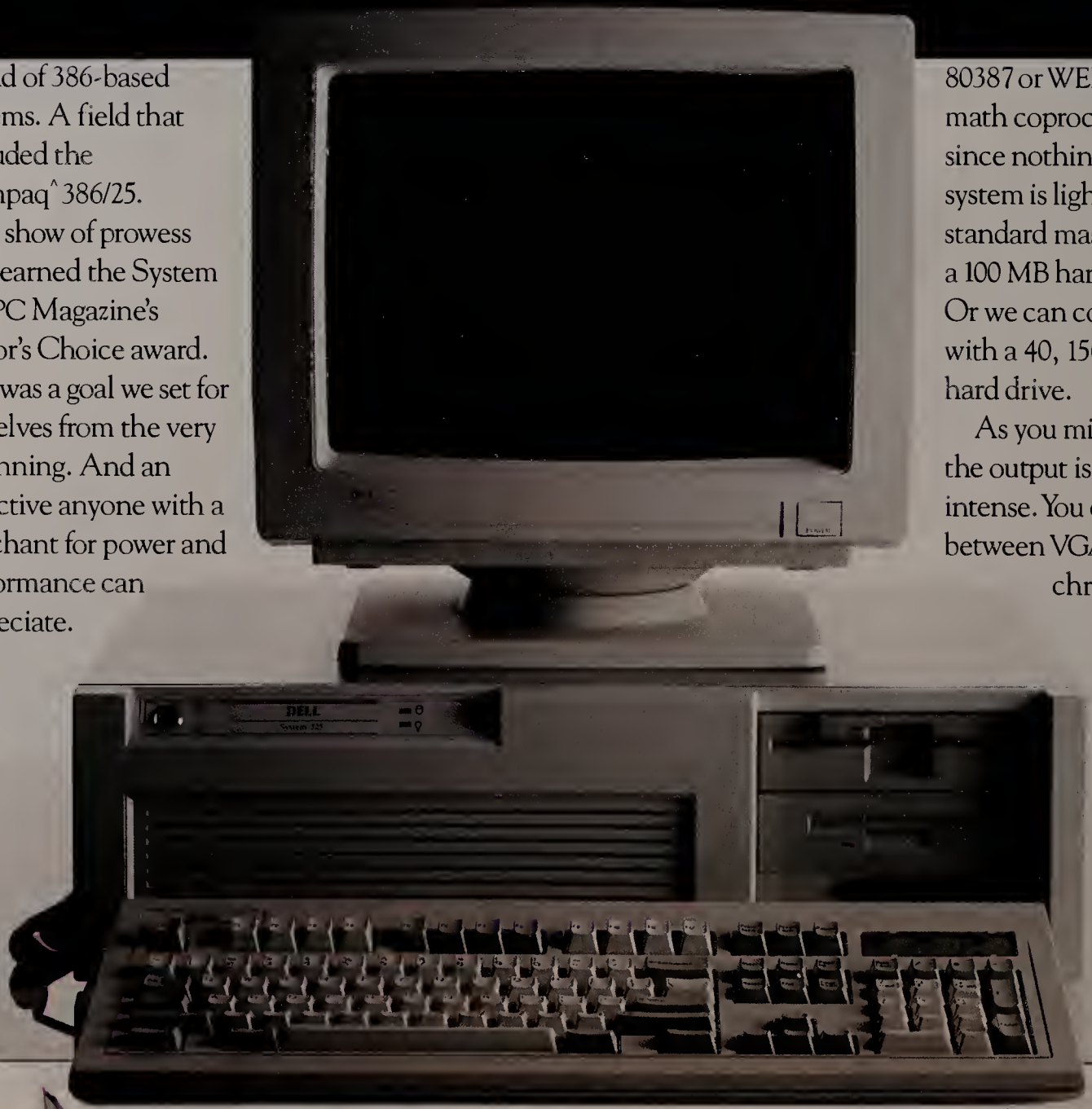
The System 325 takes that idea to its logical extreme.

For example, it runs either MS-DOS,® MS®OS/2, or our own Dell UNIX® System V. Which is compatible with AT&T's System V Interface Definition. And the world of XENIX® applications.

If speed is of the essence, we can include an optional Intel® 80387 or WEITEK 3167 math coprocessor. And since nothing about this system is lightweight, the standard mass storage is a 100 MB hard disk drive. Or we can configure it with a 40, 150 or 322 MB hard drive.

As you might expect, the output is just as intense. You can choose between VGA Monochrome with

THE DELL 386 SYSTEM 325 HAS A 25 MHz CLOCK RATE, CACHE MEMORY CONTROLLER, IDE OR ESDI HARD DISK DRIVE, PAGE MODE INTERLEAVED MEMORY, AND 100% COMPATIBILITY WITH MS-DOS, OS/2 AND UNIX SYSTEM V.



paper-white screen, VGA Color Plus, or Super VGA for high resolution colors displayed on a larger screen.

Even though the 325 gives you all this performance, it still leaves you six open slots for whatever else you might want to add.

And once you've told us what you want, we'll make sure what you want works—by burning-in the entire system unit.

COMPUTER RETAILERS ARE NO KNOWS.

There are some good reasons computer retailers won't know much about the System 325.

First, with all the new and increasingly sophisticated systems they have to keep up with on a daily basis, you can hardly expect them to know everything.

Second, because Dell sells direct.

Which means you now have the unique opportunity to talk directly with the people who make them. And ask things like, "What is page mode interleaved memory?" or, "How much SIMM RAM should I add?"

In other words, the kinds of details that are important to people who make computers and people who use them.

So dealing direct not only can save you up to the 35% mark-up, but 100% of the frustration.

WE COME WHEN WE'RE CALLED.

One of the things that very clearly sets Dell systems apart from other computers is not just how they're sold but how they're supported.

Overkill was one description used in a recent PC Week article.

Perhaps.

But then, we think you'll agree, when something goes wrong, you want as much help as possible, right?

BEST OF ALL, YOU WON'T HAVE TO EXPLAIN TO A COMPUTER RETAILER WHAT ALL THAT MEANS.

Which is why every Dell system comes with a toll-free technical support line and self-diagnostic software. We're able to solve 90% of all problems right over the phone. The other 10% receive next-day, deskside service. Thanks to our new alliance with Xerox Corporation.

And you get all this help for a full year—whenever you need it—at no extra charge.△

As you've probably guessed, one of the things that drives us most is customer satisfaction.

So we'd like to give you the ultimate guarantee:

Try a System 325 in your office for a month. Run your toughest applications. Put it through its paces, at your pace. If you're not completely satisfied, send it back anytime within 30 days. And we'll refund your money.

No questions asked.

MAYBE YOU SHOULDN'T BUY ONE AFTER ALL.

No matter how many reasons we give you to buy a Dell system sometimes it makes more sense to lease one instead.

Whether you need a single computer, or an entire office full, there is a leasing plan for your business that is just like 100% financing.

And just as we can custom configure your computers, we can see to it you get a custom designed lease plan to fit your exact business needs.† A fact that has not gone unnoticed. Especially by the Fortune 500. Over half of whom now own or lease Dell systems.

And just as we welcome their business, we welcome your business, too.

Just call us, toll-free. And don't be afraid to ask us the tough questions.

That's the part we like best.

DELL COMPUTER CORPORATION

TO ORDER, CALL

800-426-5150

FOR DELL IN CANADA, CALL 800-387-5752

Circle 74 on reader service card

PC WORLD

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Cover photograph by Pierre-Yves Goavec
Cover illustration by Carla Siboldi

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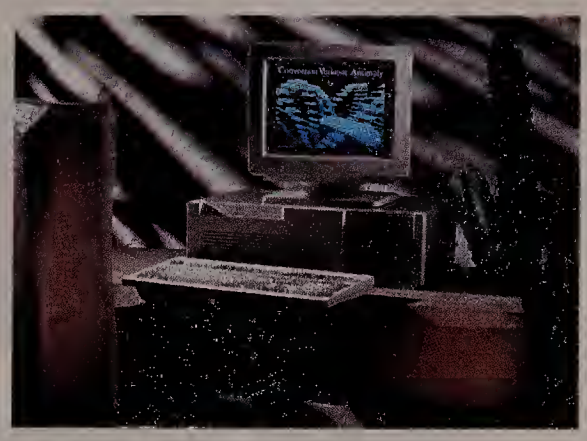

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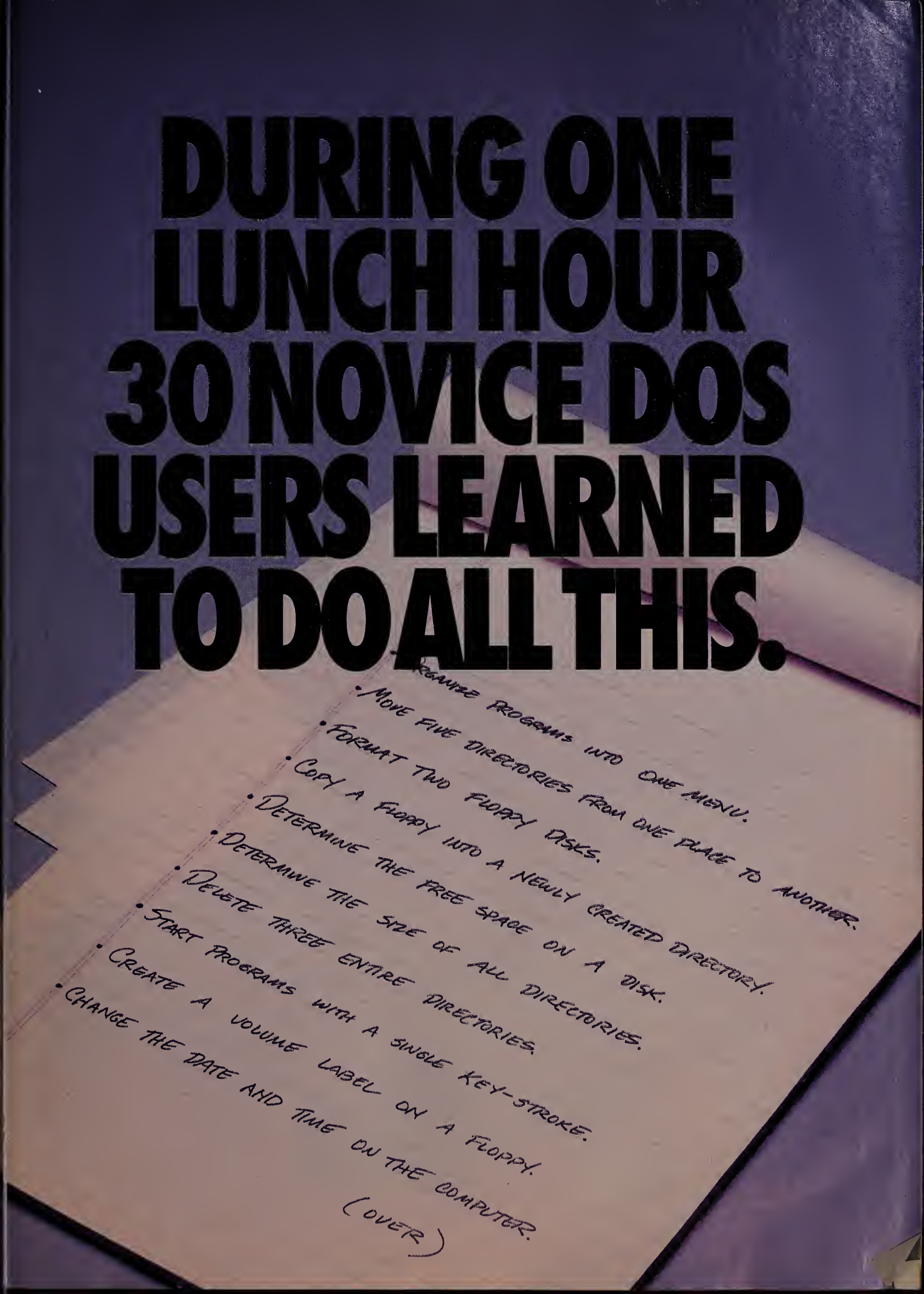
DURING ONE LUNCH HOUR 30 NOVICE DOS USERS LEARNED TO DO ALL THIS.



AND STILL HAD

THE ONLY DOS THEY HAD TO KNOW WAS A: INSTALL

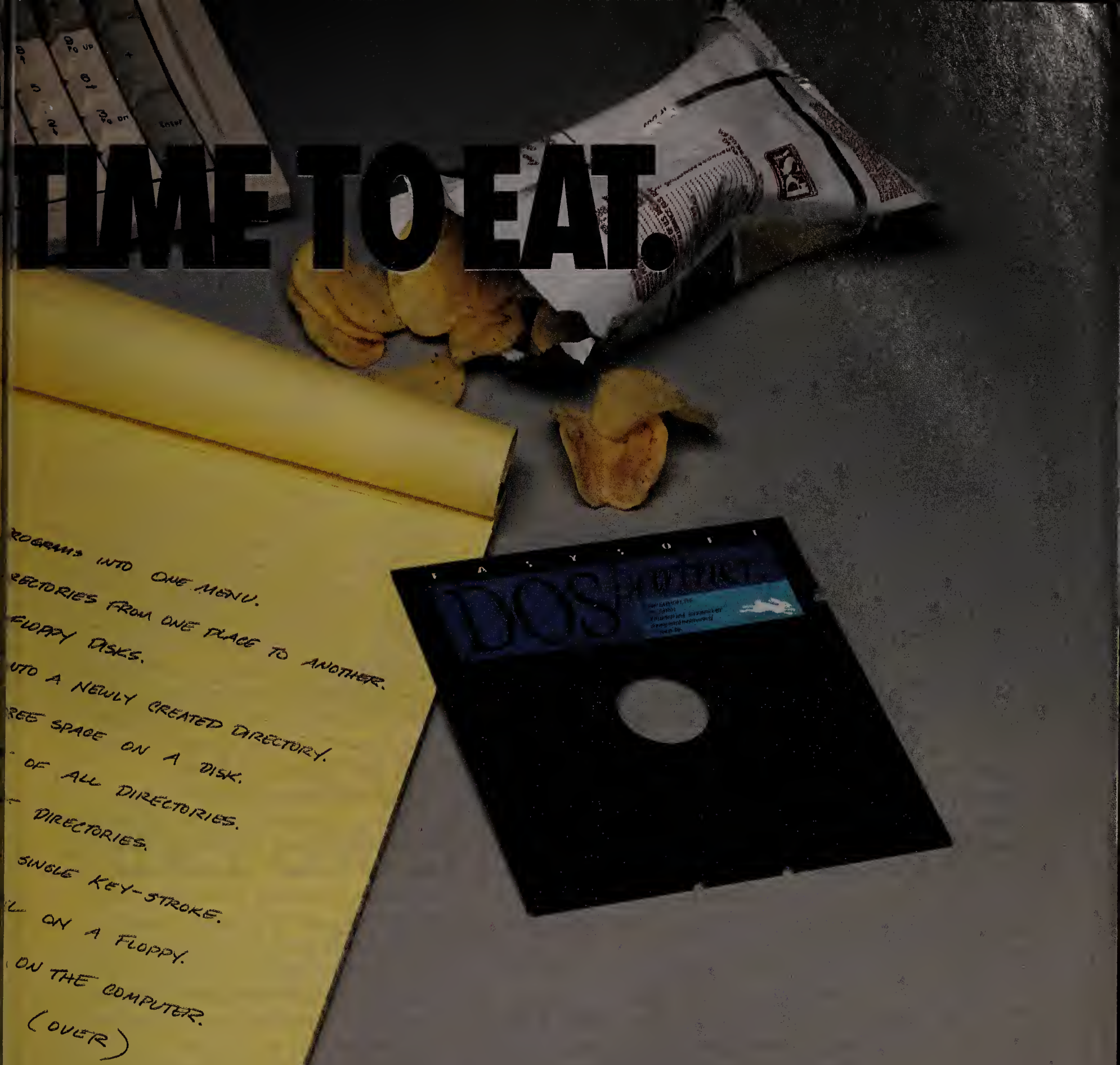
The 30 novice PC users installed DOS Partner,™ EasySoft's new integrated application, file, and drive management program. They reviewed the documentation, and within minutes they were performing tasks that typically require weeks of DOS training and experience. Like moving an entire directory, with multiple subdirectories, from one hard drive to another. Using only DOS, an experienced programmer needed nine minutes to move the directory. It took novice DOS users an average of 30 seconds to move the same directory with DOS Partner. This is just one of many complex DOS functions that become simple with DOS Partner.

DOS PARTNER MAKES DOS INVISIBLE

DOS Partner is not like shells that still require you to know DOS. It allows you to ignore DOS altogether. You and your PC speak plain English to each other. So you never run into dead ends, bad command messages or syntax errors. DOS Partner shows you all your options on the screen. If you want to move, copy or delete a full directory or a file, you simply

E A S Y

TIME TO EAT.



move your cursor to the English command and press enter. It's that simple.

DOS Partner also manages all your files, directories, and applications. You can run your programs from an applications menu with a single key stroke. Over 300 common programs are automatically recognized by DOS Partner, and others are easily added.

DOS PARTNER CAN ELIMINATE DOS TRAINING

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S O F T

The Play's the Thing

Masters of the game: Editorial Assistant Matt Lake and Assistant Editor Daniel Tynan

ROBERT CARDIN

Assistant Editor Daniel Tynan and Editorial Assistant Matt Lake pulled out a plum of an assignment in our end-of-the-year Buyers' Guide, "A Grab Bag of Games for the Holidays." Wouldn't we all jump at the chance to spend a month playing the best PC games around—and get paid for it?

"The hardest thing," Tynan admits with a grin, "was convincing people we were actually working."

"That's right," deadpans Lake. "I found myself taking a lot of work home."

But don't expect a frivolous approach to this Buyers' Guide. These guys take their play seriously, because they know that games appeal to a wide slice of PC users, from home hobbyists to Fortune 500 executives. What does it take to keep a player glued to the screen for hours at a time? Eye-popping graphics make a difference, our gamesters report, but originality and challenge count far more.

Tetris, a Soviet game built around geometric shapes, and *Nemesis Go Master*, an electronic version of the ancient Japanese board game, earned the top slots on Lake's hit parade. "*Tetris* is ludicrously simple to learn, and the graphics are basic, but after two games I was hooked. *Go Master* is almost human in the way it responds. Once you get the hang of what's going on, it's very much like playing against a real person."

Tynan, a self-confessed "political junkie," was captivated by *Hidden Agenda*, another graphically unimpressive but highly addictive game. "It's a realistic simulation of political decision making, taken directly from newspaper accounts of Central America," he reports. *Balance of Power* covers some of the same political territory, with a more conservative slant. "It's perfect for training young Henry Kissingers—the goal is to use every tactic at your disposal to dominate the world. Of course, if you blow it up, you lose."

Fortunately, the bane of the game player's existence—copy protection—is rapidly becoming a thing of the past. And the future looks bright for determined aficionados. The next generation of games may finally marry sophisticated visuals with creative play. Tynan predicts success for Sierra On-Line's upcoming line of interactive programs. "They're as complex as movies, with intricate plots, 3-D graphics, and sound tracks that use optional add-in boards for great sound."

But total immersion in games can cause one to lose touch with reality—a lesson Matt Lake learned one night when Northern California was hit by a rollicking earthquake. Roused by his spouse, Lake didn't even skip a beat. "It's only a simulation," he announced, and promptly went back to sleep. ●

Ed Bott

Ed Bott
Managing Editor

We found a measure they could both agree on.

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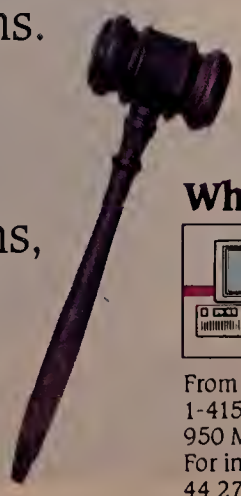

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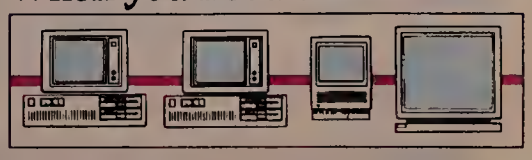

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1 The NeXT™ Computer System is the first computer in the world (and so far the only) to use read/write/erasable optical storage. While PCs today are typically equipped with Winchester drives that store 20 to 40 MB, a single optical disk can store 256 MB. Plus, it is removable, for portability and added security. This dramatically new technology provides storage that is simultaneously vast, reliable and cost-effective —a combination unmatched by computers of any size.

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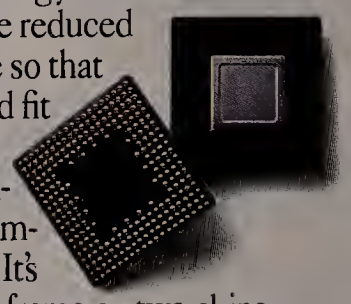
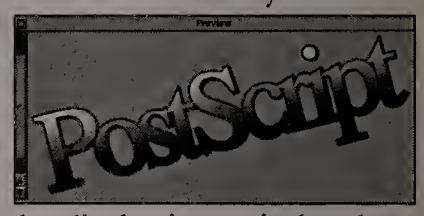
3 To achieve the power needed for the 90s, NeXT bypassed traditional workstation architecture and went directly to that of a mainframe. This eliminates bottlenecks and attains an extraordinary level of system "throughput"—the true measure of computer performance. Only through the use of VLSI (Very Large Scale Integration) technology could this architecture be reduced in size so that it could fit inside a desktop computer. It's a mainframe on two chips.



4 While PostScript® has long been the industry standard for printing, NeXT has made it fast enough to also be used on the display. This "unified imaging model" ensures that what you see on the display is precisely what you will get on paper. All your work, in any size type and any degree of rotation or magnification, appears with perfect 92-dots-per-inch clarity on the NeXT MegaPixel Display. And with laser precision at 400 dpi on the NeXT Laser Printer.

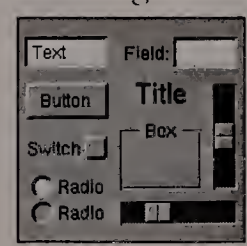


IN THE 90s, WE'L
ONLY TEN REAL BREAKTH
HERE ARE SEV

5 The NeXT Computer System is the first to be capable of producing CD-quality sound. Without requiring any additional equipment. This feat is made possible by a chip that has been specifically designed for the task of manipulating sound—the Digital Signal Processor (DSP). Because this processor is standard in every NeXT machine, software developers will be able to call upon its power to enrich programs we use every day. Now computers will not just be seen, but heard.

6 NeXT Mail takes electronic communications beyond anything you've seen on a personal computer before. Now you can send and receive multimedia mail—including text (with varied type fonts, styles and sizes), graphics and voice messages. And despite its high level of sophistication, NeXT Mail is so intuitive, you may not ever need to open the manual. NeXT Mail is built into the system, along with Ethernet and TCP/IP, so the NeXT machine can quickly become a part of existing networks.

7 Programmers can create software on the NeXT Computer up to ten times faster than on any other computer—the result of a breakthrough called NextStep.® It gives software developers the power to create the graphical user interface portion of their applications (often the most time-consuming and difficult part) without any programming at all. This revolutionary environment means we will see more programs, and better ones, in less time than ever possible before.



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10/89

486s Arrive

Vendors Jockey for Position With Powerhouse Systems

PCs built upon Intel's 25-MHz i486 processor, with or without IBM's Micro Channel or the rival Extended Industry Standard Architecture (EISA), will hold the spotlight at the COMDEX Fall show. While some might question the need for a 15-MIPS processor or buses with mainframe-style bandwidths, vendors believe "it's a question of image," says Dataquest senior analyst Peter Teige. "If you aren't up with the latest technology, it casts a shadow over your entire product line." That's a fate everyone wants to avoid, and more than 200 system makers have produced designs complete enough to "win" i486 samples from Intel. But only a handful have actually developed a clientele that needs this kind of power. Among these high-stakes players is Hewlett-Packard, whose Vectra 486 was one of the first 486s announced with EISA. When it ships at year-end, the system will squeeze up to 64MB of memory onto the motherboard and access up to 1.3GB of 15.5ms ESDI storage with a 20-mbps transfer rate and eight EISA 32-bit slots. Among many other i486 machines anticipated for COMDEX will be Micro Channel– and EISA-equipped designs from Advanced Logic Research, and Industry Standard Architecture i486s from AST and Everex. Intel expects to ship "tens of thousands" of i486 chips by year-end. Even though this chip is twice as powerful as the 33-MHz 386 and the EISA bus is an order of magnitude faster than the AT bus, Teige expects users to snap up these products.

Notebooks Get 3½-Inch Disks

Compaq and Toshiba Go NEC and Zenith One Better With Industry Standard Storage Options

Sometimes what you bring to market is much more important than when you arrive. Compaq Computer and Toshiba America have delivered a serious blow to archrivals NEC Home Electronics and Zenith Data Systems with notebook models that don't sacrifice standard storage options for portability (see the preview of Compaq's LTE and LTE/286 in this issue). Instead of using ROM cards like the NEC UltraLite or a 2-inch floppy like the Zenith MinisPort, both the Compaq LTE and the Toshiba T1000SE incorporate a slim-line 3½-inch floppy drive holding a standard 1.44MB. The LTE's drive is squeezed into an 8½-by-11-inch footprint, smaller than the T1000SE's 12½-by-10-inch form and even a smaller than the UltraLite, which launched the notebook market. While the UltraLite weighs 4.4 pounds, Compaq and Toshiba kept their notebooks to about 6 pounds while maintaining 3 to 4 hours of battery life, decent keyboards, and 80-character-by-25-line backlit LCD displays. Compaq even offers a featherweight 20MB hard drive for the LTE and a choice of a 20MB or 40MB drive on the LTE/286, which sports an 80C286 processor rather than the 9.54-MHz 80C86 that's at the heart of both the LTE and T1000SE. Like the UltraLite, the T1000SE opts for up to 2MB of ROM-based storage. The floppy-only LTE sells for a competitive $2199, while the T1000SE is a killer $1699, leaving the $1999 Zenith and the $2499 UltraLite little room to maneuver. Toshiba and Compaq researchers found users want industry-standard storage options even at the cost of added size and weight. Toshiba expects growth of 50 to 100 percent in this class of machine next year.

Hayes on the Attack

Modem Giant Slashes Prices, Boosts Dealer Margins, Matches Competitive Technology

Hayes Microcomputer Products, one of the longest-reigning dynasties in the personal computer business, has slashed modem prices by as much as 43 percent and taken other measures intended to strangle competitors and lead users toward more advanced technology. Hayes cut the Smartmodem 2400 external modem price by $100 to $499 and the internal modem price by $200 to $349. For another $40 or so on the street, customers can move up to a V-series Smartmodem 2400, whose error correction and data compression give it an effective speed of 9600 bps. Higher margins and widely advertised price drops should eliminate dealer discounting. Hayes is hardly under siege from competitors like Microcom, U.S. Robotics, and Racal-Vadic, observes International Resource Development analyst Eric Arnum. Hayes has given a few market-share points to price competitors during the past year, but it still commands as much as a 50 percent share in some modem categories. In August, Hayes neutralized its most serious price competition, Practical Peripherals, by simply buying the company. Now Hayes is taking aim at Microcom customers by announcing support for Microcom's MNP-5 protocols in the Hayes implementation of the V.42bis international standard. Deadpans president Dennis Hayes, "We believe in being a world-class competitor."

IBM Broadens Line

More Aggressive Pricing Seeks to Boost 386, 386SX Sales

While the first 486-based machines trickle out to a grateful world, IBM has launched a fall offensive aimed at solidifying its leadership in the 386 arena. Big Blue has expanded its PS/2 Model 70 line and cut some prices, and it's giving a $200 rebate on the Model 55 SX through January 15. The new $8395 Model 70 386-A61 is a basic 25-MHz 386 desktop with a 60MB, 27ms drive, while the $5795 Model 70 382-061 is the 20-MHz version of the same design. IBM has also made 2MB of memory standard on all 386 PS/2s and trimmed a few prices, most notably dropping that of the existing 20-MHz Model 70 with a 120MB hard disk $1600 to $6395. StoreBoard surveys of U.S. computer specialty outlets show that IBM overtook Compaq in sales of 386-based systems in July, while the Model 55 SX claimed a 32-point share of the 386SX market that month—a mere two months after it was introduced. Elsewhere, IBM revamped the AT-compatible (non–Micro Channel) Model 30 286 to include 1MB of memory and a 30MB, 27ms drive for $2595. Additionally, IBM will bundle several applications (headlined by *Microsoft Works*) with Models 25, 30, 30 286, 50Z, and 55 SX through January 15. Also on the software front, IBM has shipped OS/2 1.2. The next-generation operating system offers a faster file system, a friendlier interface, and support for Epson and PostScript printers—but LaserJets still need not apply.

Toshiba Debuts Desktop

Laptop Leader Seeks to Leverage Size and Name in Desktop Market

Tom Sherrard, director of PC marketing for Toshiba America Systems Division, admits that his company's first foray into desktop computing doesn't offer new technology. Toshiba has introduced a fairly standard 25-MHz 386 desktop whose most remarkable feature is seven expansion slots rather than three in a box the size of IBM's Model 55 SX. But the company, which has offered a striking line of laptops since 1986, will aim its T8500 at customers who want the Toshiba label more than a feature-rich clone. "We've had a lot of response from end users looking for an alternative to clones from small, potentially less stable companies," says Sherrard. The T8500 is just the entrée for a line of 386 or better desktops, says Sherrard, who adds, "We don't expect to be an overnight success, but we are a $30 billion company twice as old as IBM, and we want people to know that we are in this business for the long term." Elsewhere, Toshiba combined a 386SX processor and a new kind of gas plasma display to create the first high-end portable capable of useful battery-powered operation (about 3 hours' worth). The $5995 T3100SX is intended for field automation, a market that Toshiba sees growing at a 30 to 50 percent clip. The company will follow with other battery-powered, upscale machines, but it won't retrofit current models with the new display technology.

Zenith Divests PCs

Zenith Data Systems Sold to France's Groupe Bull

Unable to sell off its troubled consumer business, Zenith Electronics will cover its half-billion-dollar debt by sacrificing its profitable PC subsidiary to France's Groupe Bull. The $1.4 billion business—combining Zenith Data Systems (ZDS), electronic kit maker Heath Company, 70 Heath/Zenith computer stores, and component manufacturing operations (all of which add up to a majority of Zenith's sales)—will go to the veteran large-system manufacturer for a price based on net assets at year-end. Net assets currently total $635 million, but the figure should drop as inventory is sold off. (Zenith recently dumped thousands of units of a discontinued TurbosPort 386 model to a liquidating company, which is selling the $8000 machines for about $3000 each.) Groupe Bull says that ZDS's 4000 employees will continue operations as usual under ZDS president John Frank and other key executives. About one-tenth of Bull's $5 billion annual sales comes from relabeled PCs, all of which will now be built by ZDS. "Being part of a large, deep-pocketed international concern will definitely improve [Zenith's] position," comments Merrill Lynch analyst Charles Ryan. ZDS, which claims DOS PC shipments second only to IBM in 1988, stumbled slightly this year as its huge Defense Department contract ended and price competition eroded commercial profits. "But the volumes are still there," a ZDS spokesperson declares, "and we're still the market leader in laptops." ZDS will continue to offer its Flat Tension Mask monitors under a nonexclusive deal with its former parent. Bull, owned primarily by the French government, first plunged into the U.S. market in 1987 when it combined with mainframe partner NEC to buy the battered remnants of Honeywell's computer business. ●

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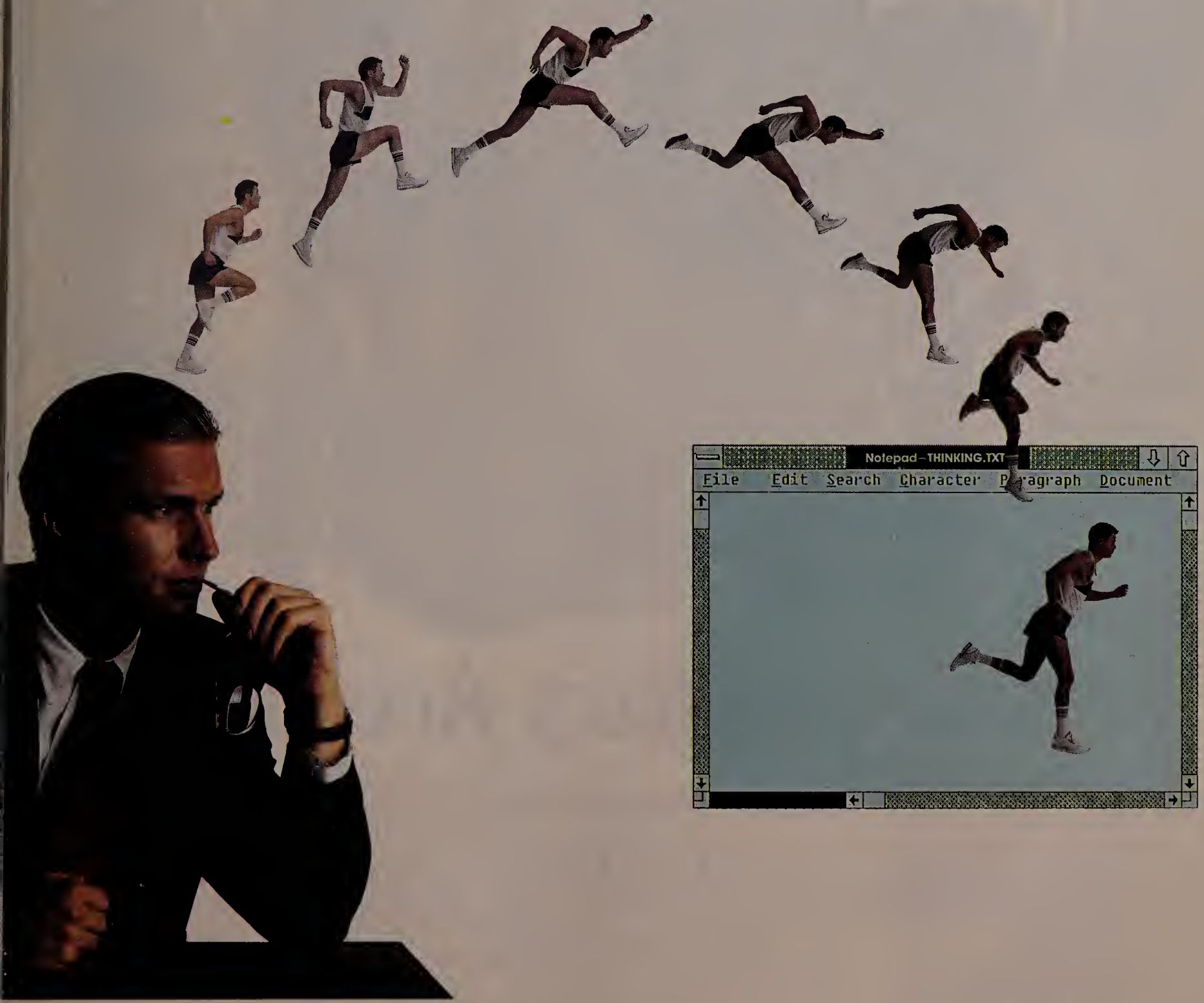

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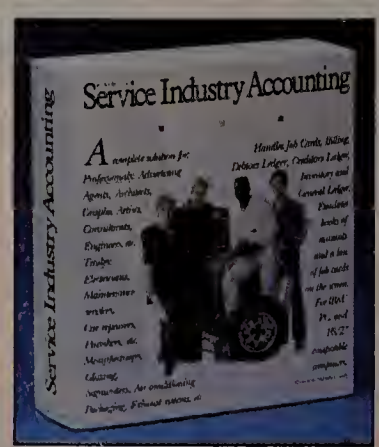

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Richard Landry

Wish List for 1990

1989 gave us another yearlong lesson in delayed gratification.

Will the PC industry start delivering on its next-generation promises in 1990?

Here's what I get for being optimistic. Last December in this column I wished out loud that IBM would put some oomph into its PS/2--OS/2 strategy, that Microsoft would bundle *Windows* with DOS, that Compaq would deliver on EISA, and that Ashton-Tate would call off its war on *dBASE* clones. Admirable goals, I thought. But with only Compaq ready to make good before year's end, things have started to look pretty grim on the wish-fulfillment front.

Now, some of those companies might claim I actually did better than I think. For example, in 1989 IBM rolled out *OfficeVision*, which gives PS/2s some Mac features and distributed data base capabilities—for the price of 8MB or more of memory and OS/2 Extended Edition. And Microsoft is at least talking up the idea of delivering *Windows* with DOS. So maybe my wish list was really just ahead of its time!

It's true that the PC world was largely stalled in 1989. The cost of moving over to OS/2 remains staggering, and few existing applications demonstrate any compelling reason to do so. But with almost every company claiming imminent breakthroughs in power and ease of use, I can't resist the temptation to fantasize on how 1990 could become a year to remember. Wish me luck—I'll need it.

IBM Embraces Windows Big Blue's worried about the almost wholesale user rejection of OS/2, so to spur sales, it's been offering PS/2 memory upgrades at ridiculously low prices. But that doesn't do much for the loads of OS/2-incapable machines out there in the real world. If IBM wants the owners of those systems to migrate to its next-generation vision, it must offer a smooth, intelligent upgrade path. *Windows* provides such a path, in tandem with a 386 version of OS/2 that will be able to run multiple DOS and *Windows* applications. Big Blue reportedly fears that *Windows* will further depress OS/2 sales. Just the opposite: Once users spy a clear way to get from DOS to OS/2, they'll start moving.

IBM Embraces Next Here's another area where Big Blue could capture a natural leadership position. Next has a great environment that developers and users love. IBM also has a sweetheart deal with Next, permitting IBM to sell the NextStep environment with its PS/2s. This deal gives Next what it wants—a solid business partnership to battle Apple; and it gives IBM something pretty important, too—a foothold in the hot new field of "personal workstations." And exposure to an alternative user interface may help IBM see where it can improve on OS/2's Presentation Manager.

NewWave Takes Off If you've seen OS/2 version 1.2, then you know that it's really not much better than version 1.1. Although Presentation Manager now has a 3-D look and better mouse support, PM still doesn't give you a simple way to integrate live information from multiple applications—word processor, spreadsheet, and graphics programs, for example. *OfficeVision* is Big Blue's answer to this problem, but Hewlett-Packard's *NewWave* is more powerful,

(continues)

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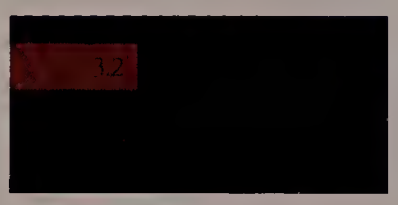
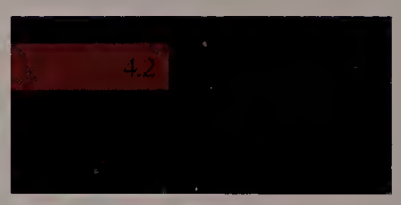
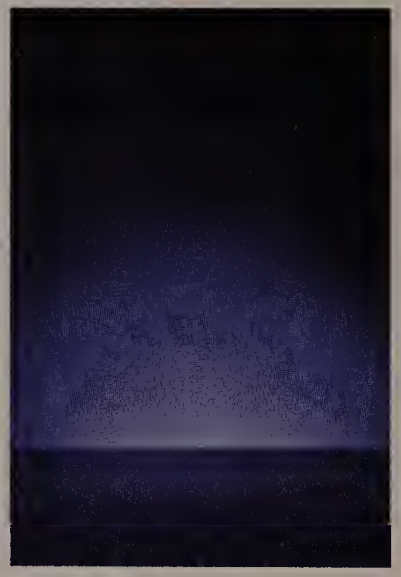


NO COMPARISON

EVEREX STEP
286/20



NO COMPARISON



EVEREX STEP
386*is*

COMPAQ DESKPRO
386s

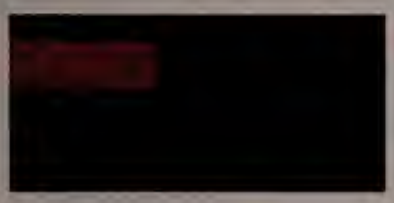
**MIPS benchmarks based on The Database Group Power Meter MIPS version 1.2.*

As you can plainly see, every Everex STEP™ system, from one end of our IBM® compatible line to the other, runs a good deal faster than anything the competition has to offer. So if you're looking for the absolute fastest way to run today's complex applications, it's time to take a closer look at our STEPs.

What you'll find is the thing that makes them faster. Namely, superior design. One example is our proprietary AMMA™ cache management architecture that lets you tear along at record speeds, especially in multi-user, multi-tasking applications. And AMMA is application transparent. So you gain speed without losing compatibility.

PC MAGAZINE
EDITORS' CHOICE
August 1989
Everex STEP 386*is*

EVEREX STEP
386/16

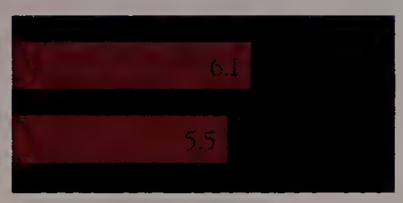


NO COMPARISON
(Discontinued Model)

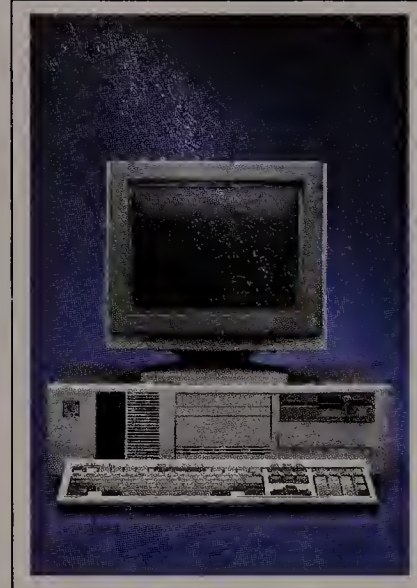
EVEREX STEP
386/20

COMPAQ DESKPRO
386/20e

EVEREX STEP
386/25



COMPAQ DESKPRO
386/25



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Circle 75 on reader service card

All Video Display Terminals (VDT s) emit electromagnetic radiation that bathes the user through the screen. The figure on the left shows a visualization of electromagnetic radiation from the VDT s, and in red from the screen. The photo on the right shows that the NoRad Shield™ virtually eliminates screen-emitted E-field electromagnetic radiation.

VDT Radiation Is it harmful?

. . .The membranes of cells can be sensitive to even fairly weak externally imposed low frequency electromagnetic fields. Extremely small signal changes can trigger major biochemical responses critical to the functioning of the cell. U.S. CONGRESS, OFFICE OF TECHNOLOGY ASSESSMENT REPORT

Women who used VDTs for more than 20 hours each week in the first trimester of pregnancy suffered almost twice as many miscarriages as women in other types of office work.

The New York Times

Now you don't have to accept the risks. NoRad Corporation has introduced the NoRad Shield which virtually eliminates the through-screen non-ionizing E-field electromagnetic radiation while disposing of glare, reflections, and the static electric field.*

FREE BOOKLET To get the facts, write or call and ask for our free booklet entitled, "VDT Health Hazards."

The NoRad Shield is available for all IBM PC and compatible screens, monitors, and displays.

Evidence mounts which shows a connection between non-ionizing radiation and skin irritation, eye damage, and an increase in miscarriages.

*99.999% E field attenuation from 20kHz to >200MHz. H field >50% above 30kHz.

NoRad

800-262-3260 Ext. 500
NoRad Corporation 1549 11th St.
Santa Monica, Ca 90401 213-395-0800

NoRad Shield is a trademark of the NoRad Corporation.

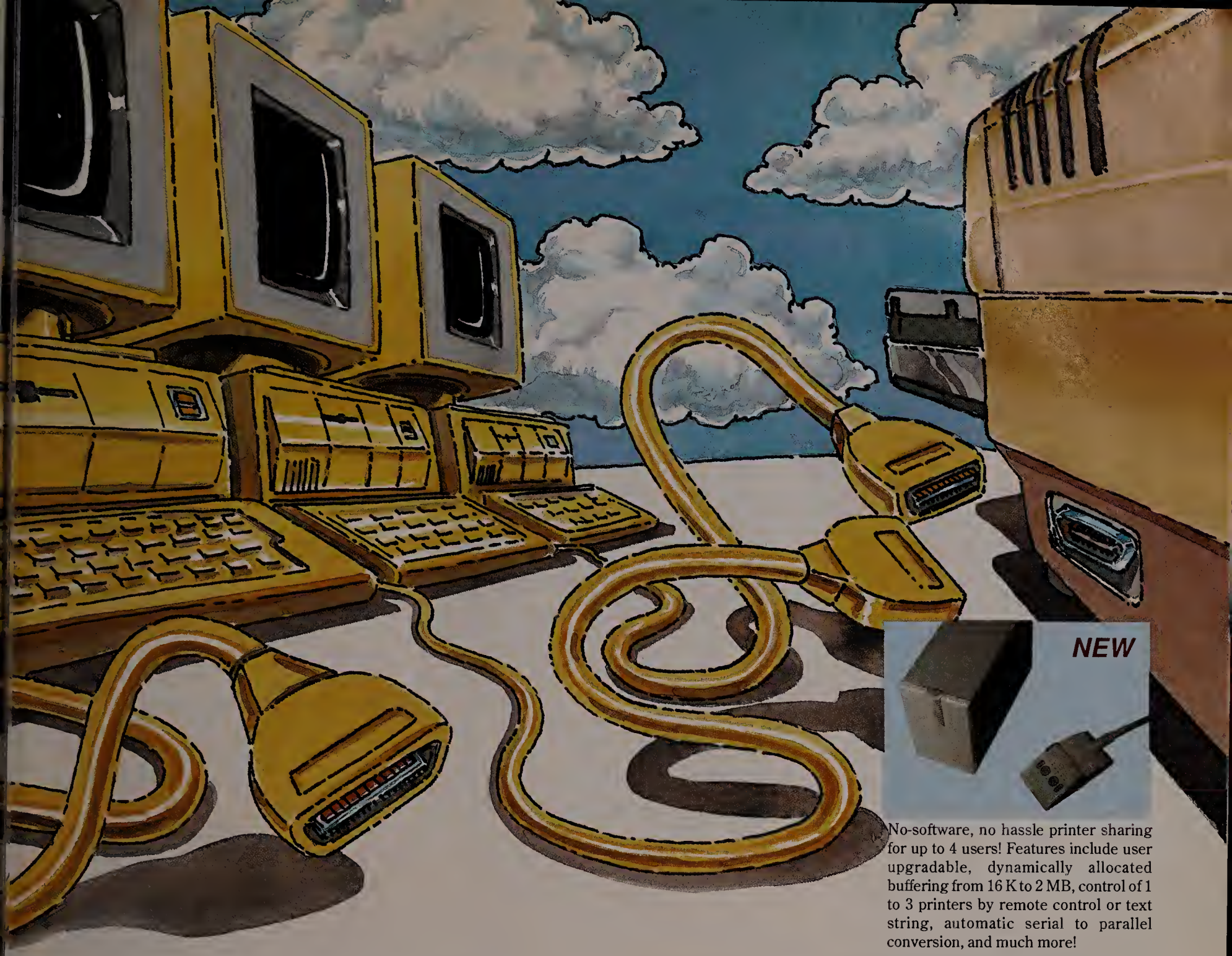
Circle 180 on reader service card

takes much less RAM, and runs under both *Windows* and OS/2. If HP can convince enough developers to support it, then *NewWave* will give *OfficeVision* a well-deserved run for its money.

Font Wars End; HP Wins In the mad rush to form an imaging standard that frees them from Adobe's clutches, both Microsoft and Apple seemed to forget that PC users will worry about the impact of any new technology on their huge investment in HP LaserJets. Meanwhile, HP is hard at work on ways to integrate its own PCL 5 printer language directly into *Windows* and OS/2, giving LaserJet users most of the power of the Apple/Microsoft font technology at a fraction of the price. Apple and Microsoft will have to work very hard to match the price/performance ratio that PCL 5 will offer for business use.

So that's it for 1990. Just as in 1989, users who make informed business decisions will determine what's hot and what's not in the PC world. Last year, you took a wait-and-see approach to OS/2. This year, will you choke on new, overwhelming technologies—or will the PC vendors start delivering the simple, compelling solutions you're looking for?

As always, I'm interested in your opinions on this or any other subject. Write to me at *PC World*, 501 Second St., San Francisco, CA 94107; fax 415/442-1891; MCI Mail Richard Landry/301-3685. ●



No-software, no hassle printer sharing for up to 4 users! Features include user upgradable, dynamically allocated buffering from 16 K to 2 MB, control of 1 to 3 printers by remote control or text string, automatic serial to parallel conversion, and much more!

Looking For a Better Connection?

What good is it having more than one computer if you can only print from one at a time? Maybe you have different types of printers, and you'd like to use them all without having to constantly disconnect and switch cables.

Don't you think that all your equipment should work interchangeably or simultaneously as needed, without any downtime at any one station? Isn't that the reason you purchased all that high-tech hardware?

Kansai has a better connection for a better solution to your problems. Quality buffers, sharing systems and interface converters; economical but vital peripherals that can save you more time and money than you probably realize.

Why not really complete your system? Get the Kansai connection.

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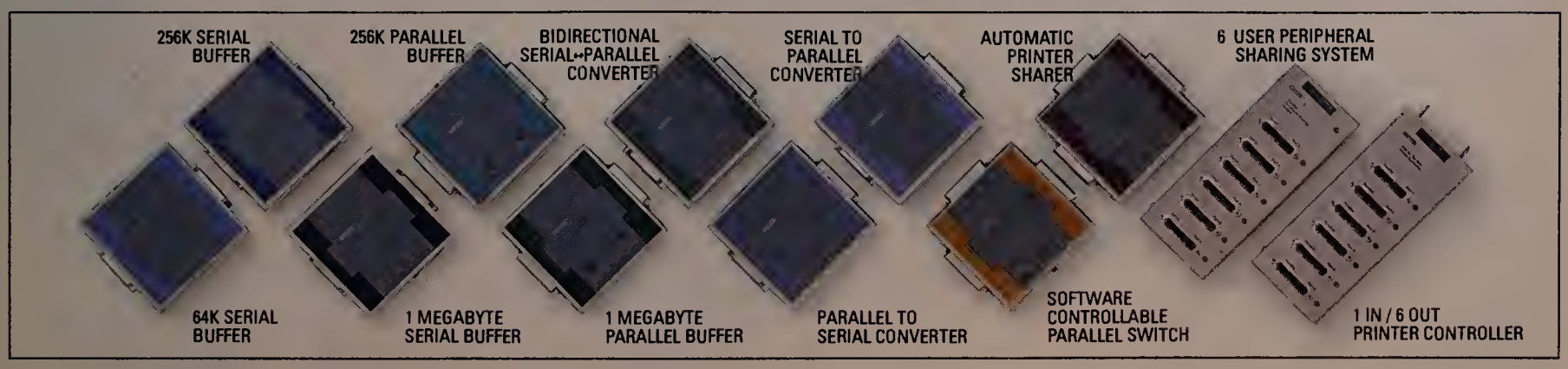

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Circle 149 on reader service card

AW...What the Heck!
We REFUSE to Raise Our Prices!
DesignCAD 3D $ 399

WE REFUSE TO RAISE PRICES!

"We have dealers—even from foreign countries—call and tell us they could sell a lot more DesignCAD 3D at higher prices because some of their customers can't conceive a true 3D solid modeling program costing only $399. They ask us to raise our prices because they know it's worth more, much more. But look at the history of our company: We just don't believe in inflated prices! An excellent CAD system shouldn't cost any more than a good word processor. So we still say, "Aw...What the heck! We refuse to raise our prices! Let's see the other guys beat this deal!"

WHY BUY THIS ONE?

There is a very important reason to buy DesignCAD 3D other than price: PERFORMANCE. DesignCAD 3D provides complete 3-Dimensional drawing capabilities. It's not a "warmed-over" 2D program. DesignCAD 3D allows you to draw any entity in 3-D space. This means, for example, that you can draw a curve in the shape of a spring. You can draw a circle or arc at ANY angle on ANY plane.

DesignCAD 3-D gives your Personal Computer the power of a mainframe CAD system! With DesignCAD 3-D, you can produce complete 3-dimensional models and drawings that were once considered impossible on a microcomputer!

Complete 3-Dimensional design features make it easy for you to construct realistic 3-D models. With full solid-object modeling capabilities you can analyze you drawing to determine the volume, surface area or even center of gravity! DesignCAD 3-D even permits you to check for interference between objects! Aeronautical Engineers can now find the center of gravity for a new airplane design with a couple of keystrokes. The Architect can determine the surface area of a roof for decking in a matter of minutes. The Civil Engineer can calculate the volume of a lake or dam in seconds. The Mechanical Engineer will know for sure if certain parts fit together without interference. The uses for DesignCAD 3-D are only limited by YOUR imagination!

DesignCAD 3-D supports more than 400 different peripheral devices, including more than 250 printers (dot-matrix, laser printers, color printers, etc.), 80 plotters, most mice and digitizing tablets, and a wide variety of graphics cards and displays.

Once again, American Small Business Computers has proved that you don't have to spend a lot of money to get quality software. DesignCAD 3-D provides features such as Shading, Solid Object Modeling, Hidden Line Removal, and Cross Sectioning capability. All for only $399. No other 3-Dimensional CAD system can come close to providing the price/performance of DesignCAD 3D.

VERY EASY TO USE!

DesignCAD 3-D has consistantly proven itself to be faster and easier to use than most competing CAD systems. In a national competition DesignCAD 3-D was matched in drawing speed by only one other CAD system. It cost $3,000. DesignCAD 3-D was able to perform a given drawing in nearly half the time as packages costing up to $5,000.

Customers frequently remark at how quickly they are able to learn DesignCAD. Many also comment about the power of DesignCAD.

Dr. Stephens of NASA states: "One of the things I like best [about DesignCAD 3D] is that I can pick it up and go with it." Dr. Stephens, who evaluates and recommends software for purchase by NASA, says software must meet certain criteria: "One, it must work. Two, it must be user friendly and easy to use. I push it [DesignCAD 3D] as far as I can push it. We're not using it as a toy down here, and I resent the fact that some people believe that a product's ability is substandard because of its price."

Jan Hallett, an engineer at Allied Chemicall states: "We use it extensively here and are really sold on it. Plant layouts, pipe runs, fabrications, along with a lot of other things are drawn and designed. I've got AutoCAD, but very seldom if ever use it anymore."

PC MAGAZINE SAYS...

DesignCAD 3D, the latest feature-packed, low-cost CADD package from American Small Business Computers, delivers more bang per buck than any of its low-cost competitors and threatens programs costing ten times as much. For a low-cost, self-contained 3D package... DesignCAD's range of features steals the show."

HOW DO I GET ONE?

DesignCAD 3-D and DesignCAD 2D are available from most retail computer stores, or you may order directly from us. If you have questions about which program to purchase please give us a call. All you need to run DesIgnCAD 3-D is an IBM PC or compatible computer with 640 K RAM memory and a hard disk. Both products support most graphics cards, printers, plotters and digitizers. Free Information and a demo disk are available .

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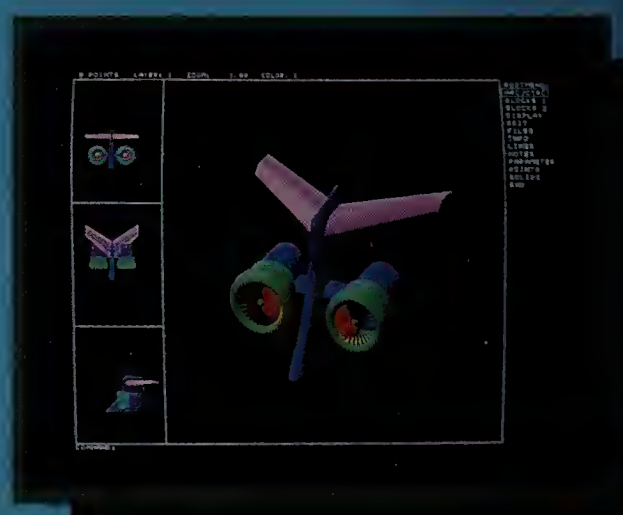
VERY POWERFUL!

DesignCAD 3-D version 2.1 is as powerful as most CAD systems costing $5000-$10,000! Features like: Complex Extrusions, a true 3D color-coded cursor, full shading or rendering capability, Blending of Surfaces, Complex Sweeps and Translations, and Boolean Operations make DesignCAD 3-D one of the most powerful 3-D CAD systems available...at any price! Engineers, Architects, and Consultants constantly tell us that they use CAD systems costing thousands of dollars which are not as powerful as DesignCAD 3-D.

BYTE MAGAZINE SAYS...
"At $399, DesignCAD 3D was the least expensive package we saw, yet it was one of the more powerful. ..Don't be fooled by the remarkably low price, this program can really perform!"



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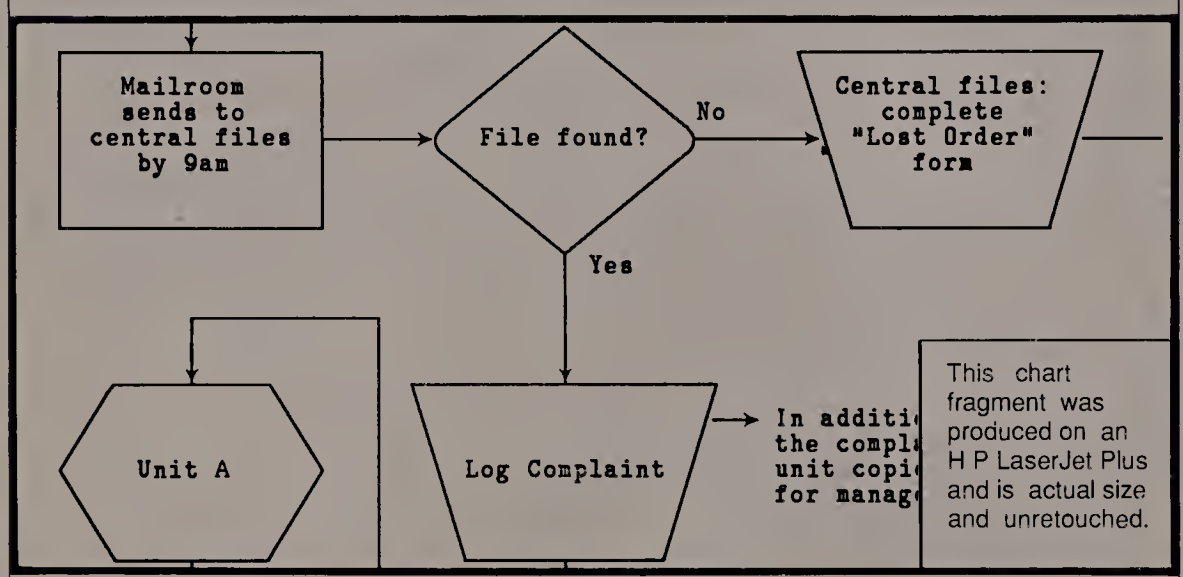
EasyFlow

An on-screen chart processor that knows about charts and diagrams, not just another "screen-draw" program that makes you do most of the work. **EasyFlow** is a powerful full-screen graphics program dedicated to data-flow diagrams, flow charts and organization charts. With it you can quickly compose diagrams. More important, you can easily modify them so they are always up to date.



Automatic. Fully automatic text centering within shapes. Fully automatic line routing & re-routing. Fully automatic placement of text along lines.

Fast. Written in assembly language for speed.

Large. Diagram size limited only by available memory. Supports LIM expanded memory. Diagram too large for your printer? EasyFlow automatically breaks the diagram up & prints it in page size pieces.

Standard. All standard data flow and flowcharting shapes included. Other shape libraries are available.

User friendly. Don't take our word for it. PC Magazine says *"EASYFLOW lives up to its name. It's hard to imagine any easier and more flexible way to produce basic and even complex flowcharts"*.

Mouse. Optional but fully supported.

It works. Over 50,000 copies sold. Two of the "big eight" accounting firms have world wide site licenses for the use of EasyFlow.

It prints. On most popular printers including IBM, Epson, Toshiba, HP LaserJets, HP Desk Jet XEROX 4045, postscript printers and many others.

It plots. On HP7440, 7475, 7550 and 7585B plotters.

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Rush delivery: Order by noon today (eastern time) and you'll have it tomorrow. Rush delivery charge is $10.50 (instead of $2.00) and is available only to continental USA and Canada.

EasyFlow works on IBM PC's, IBM PS/2 and compatibles. Requires 512K memory, hard disk and an IBM CGA/EGA/VGA or Hercules monochrome compatible adapter card.

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Next in

PC WORLD

January

Computing in the Nineties

How will your business maintain a competitive edge in the next decade? High-powered hardware is part of the solution, with well-connected networks tapping the power of muscular processors like the Intel 486 and the Motorola 68030. But smart businesses will exploit the power of these new platforms with software so flexible and intuitive that users will be able to create productive applications without hiring a developer or writing a line of code.

We'll take an inside look at the evolution of the next generation of application development software, from simple tools like *HyperCard* and *HyperPAD* to true end-user development environments like Hewlett-Packard's *NewWave* and Metaphor Computer's "data interpretation" software. We'll also look behind the shiny new technology at the questions that matter most to managers: How much will it cost? And where's the payoff?

Look&Link

Build giant multi-sheet applications in 1-2-3.

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See more rows and columns with windows and graphs.

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Reveal hidden trends and relationships in 1-2-3.

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Turns 1-2-3 or Symphony into a powerful database.

UltraVision

Supercharger for EGA and VGA displays.

SmartNotes

Like 3M Post-it Notes™ for your PC.

The cure for 1-2-3 Release 3 envy

Look&Link™

1-2-3™ Release 3 delivers impressive 3D features. But many PC users don't have the hardware to run it. And many others are surprised when they discover its trade-offs.*

Let's face it. Lotus has sold us on the *idea* of multi-sheet applications but offers a solution that many 1-2-3 users can't or won't accept. Personics offers a kinder and gentler solution.

LOOK&LINK™ lets you build true multi-sheet applications in 1-2-3 without moving to Release 3. You get dynamic linking and consolidation plus the ability to see two worksheets on screen at the same time. Noted columnist Jim Seymour says, *"LOOK&LINK could be the answer to Lotus users' prayers... It is a lot more important to a lot more users than Allways."*

With LOOK&LINK, any worksheet can pull values out of other worksheets on disk or in expanded memory. (Supported, *but not required!*) There's no limit to the number of linked sheets, and linked values flow in automatically when you load or recalculate. LOOK&LINK even supports automatic chained linking – sheet 1 draws from sheet 2 which draws from sheet 3, etc.

LOOK&LINK's dual sheet display makes setting up links a snap. Just point and shoot. You can also cut and paste between sheets.

For consolidations and roll-ups, LOOK&LINK makes life especially easy. You can sum a stack of sheets in seconds. So join the party. Now any 1-2-3 user can build applications that span across worksheets.

LOOK&LINK 1.1 is an add-in for 1-2-3 Release 2, 2.01 and 2.2. No special hardware or expanded memory is required. Satisfaction guaranteed.

LOOK&LINK adds multi-sheet features to 1-2-3 Rel 2, 2.01 and 2.2

	1-2-3 Release 3	Release 2.2 2.01 & 2.0	Release 2, 2.01 & 2.2 with LOOK&LINK
Link to a single cell	YES	2.2 only	YES
Link to a range	YES	no	YES
Link to a lookup table	YES	no	YES
Linked values in formulas	YES	no	YES
Automatic chained linking	no	no	YES
See two sheets on screen	YES	no	YES
Cut & paste between sheets	YES	no	YES
Point-and-shoot link setup	YES	no	YES
Automatic consolidation	YES	no	YES
Hierarchical consolidation	no	no	YES

*Release 3 is two to three times slower than Release 2.01 in PC Magazine benchmarks. (9/12/89 issue.) It needs lots of memory, lots of hard disk space, and does not support Release 2 add-ins. Expanded memory cards must be re-configured.

"I have a lot of programs on my hard disk, from a lot of vendors – but no other firm is represented by five titles. And no other utility vendor delivers as much value to my kind of computing as Personics."

Jim Seymour
PC Week
January 30, 1989

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WordStar 2000		9.95
Write Your Own		9.95

ESSENTIAL COMMANDS are organized into logical sections for easy reference.

FUNCTION KEY DIAGRAM identifies all function key assignments at a glance. **Vertical function key overlay also included.**

TWO-SIDED PLASTIC design fits all keyboards, wipes clean.

INDEX TABS and logical organization assure fast access to procedures.

GUIDELINES, illustrations, and examples aid learning and review.

STEP-BY-STEP outline of commands and procedures is easy to follow.

SPIRAL BOUND pages lie flat, turn easily. Built-in easel, too.

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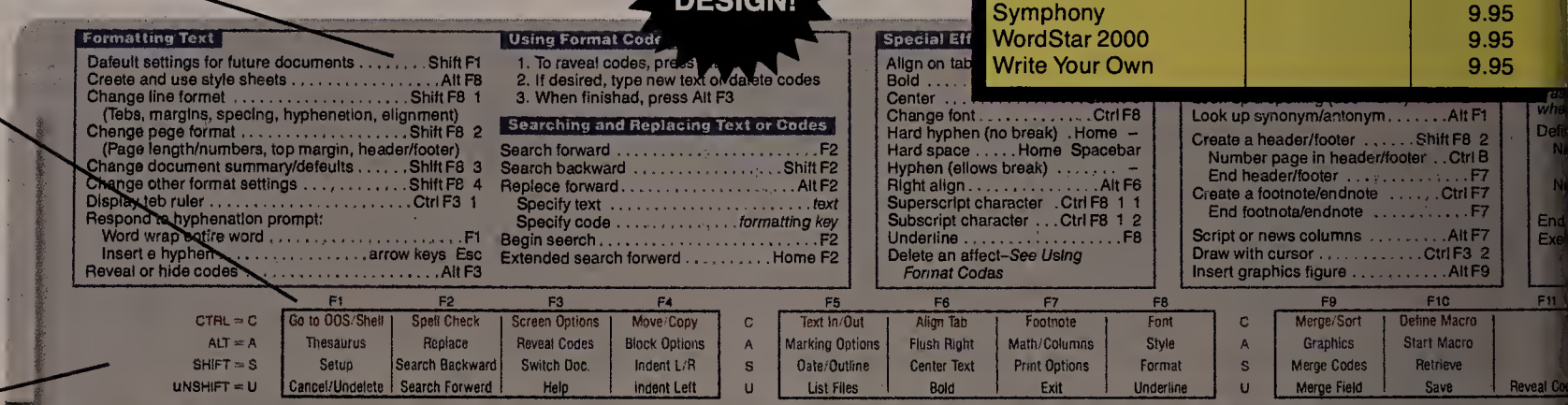

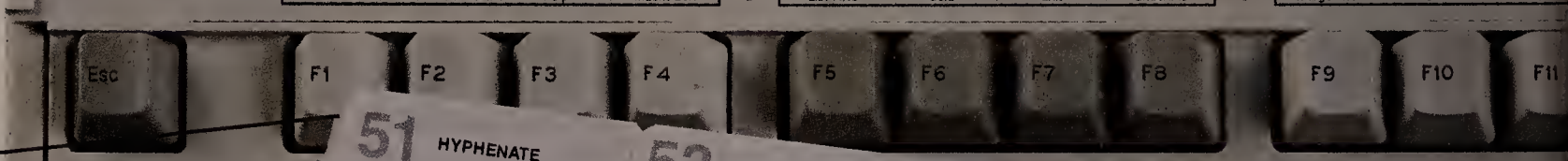

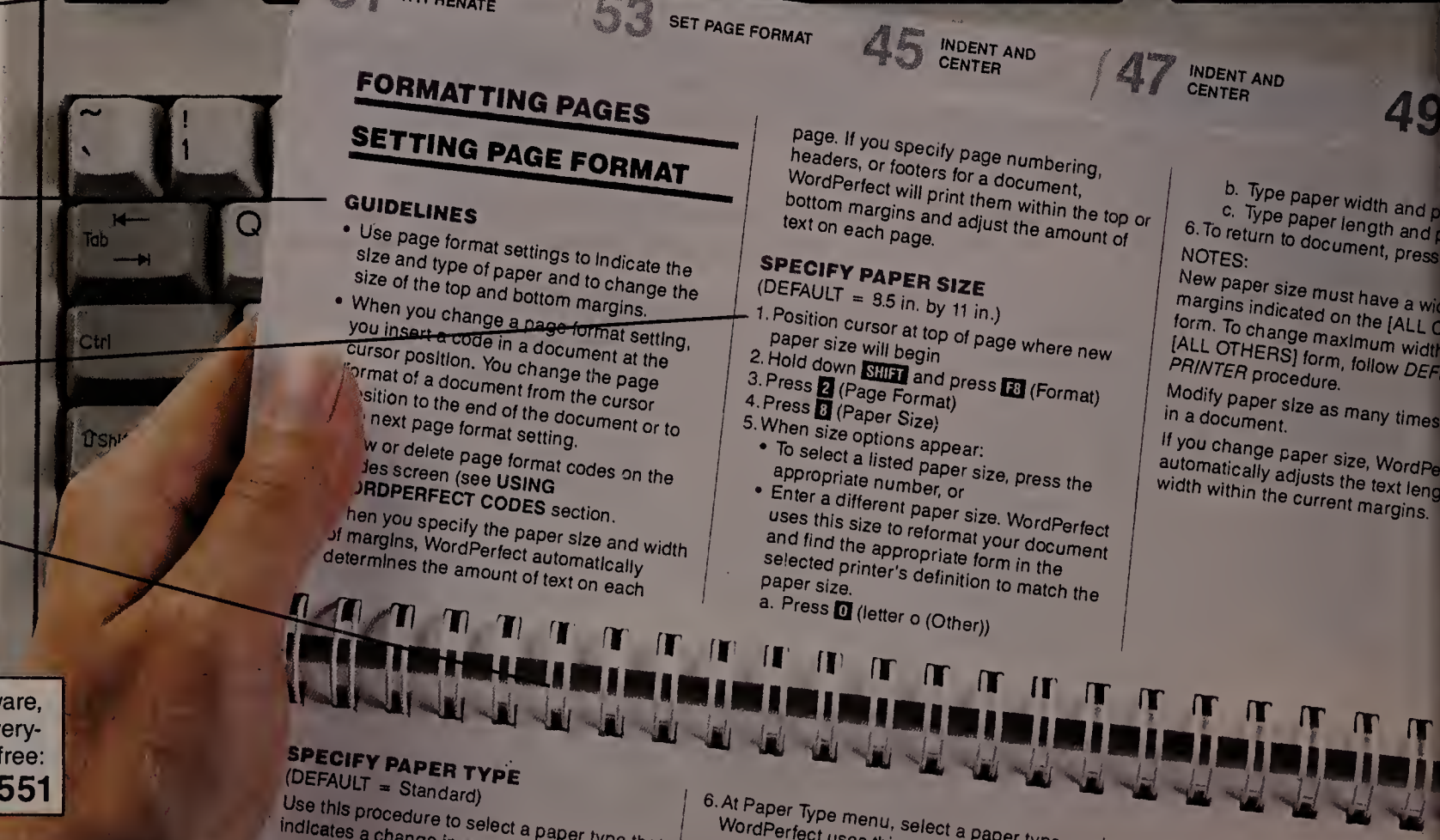

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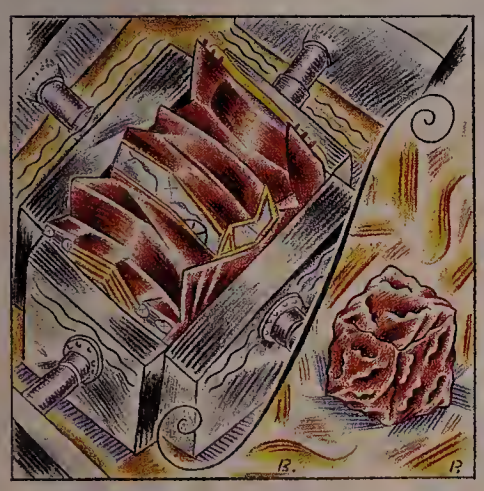
LETTERS

Reactions and responses from the PC World community



BUD PEEN

Raters of the Last ARC

Hal DuPrie ["Why Change What Works?" *Another Angle*, September 1989] says the file compression utility *ARC* is good enough for him, and he doesn't want to change. I would have preferred to read something that encouraged competition to produce excellent—not just adequate—products. He ignored other compression methods such as *ZOO* and *LHARC*, and the dynamic of the marketplace that produces such innovation. Maybe someone will develop a compression format with *PKZIP*'s speed and *LHARC*'s compactness. If they do, I doubt you'd find it on Mr. DuPrie's BBS first.

Tim Mullen
PDN Software Services
Cincinnati, Ohio

Mr. DuPrie skips over *ZIP*'s size advantage, neglecting the fact that condensed storage is an archiving product's raison d'être. I'm sure his callers would be grateful to see a 10 to 20 percent reduction in the cost of connecting with his service, and cost is the penalty one suffers downloading larger *ARC* files.

Ken Prevo
Lowell, Indiana

Mr. DuPrie estimates *ZIP*'s compression ratio to be 5 to 10 percent better than *ARC*'s. That is the minimum improvement. *ZIP* can produce files 25 to 30 percent smaller than *ARC* and can do it faster.

Lowell Cunningham
Knoxville, Tennessee

Mr. DuPrie says that *some* BBS operators have started using *ZIP*. That's quite an understatement. It has become the current standard on virtually every nonsubscription board I have called in the last four months. Perhaps the pay boards are slower to change.

Douglas Haire
Vice President
Jacksonville PC SYSOPS Association
Jacksonville, Florida

You say that *ZIP* is available only for DOS machines. There is also an OS/2 version.

Charles Hague
SYSOP
The Wrong Number BBS
Stockton, California

Mr. DuPrie finds *ARC* "more user-friendly than *ZIP*." To unarchive either sort of file, you type a command and a file name. Give us a break, Mr. DuPrie—your statement is neither honest nor fair.

Robert Alexander
Maryville, Tennessee

ARC is the dinosaur of compression. Its failure to improve and dependence on inertia and legal nonsense to maintain its position doom *ARC* to an early demise.

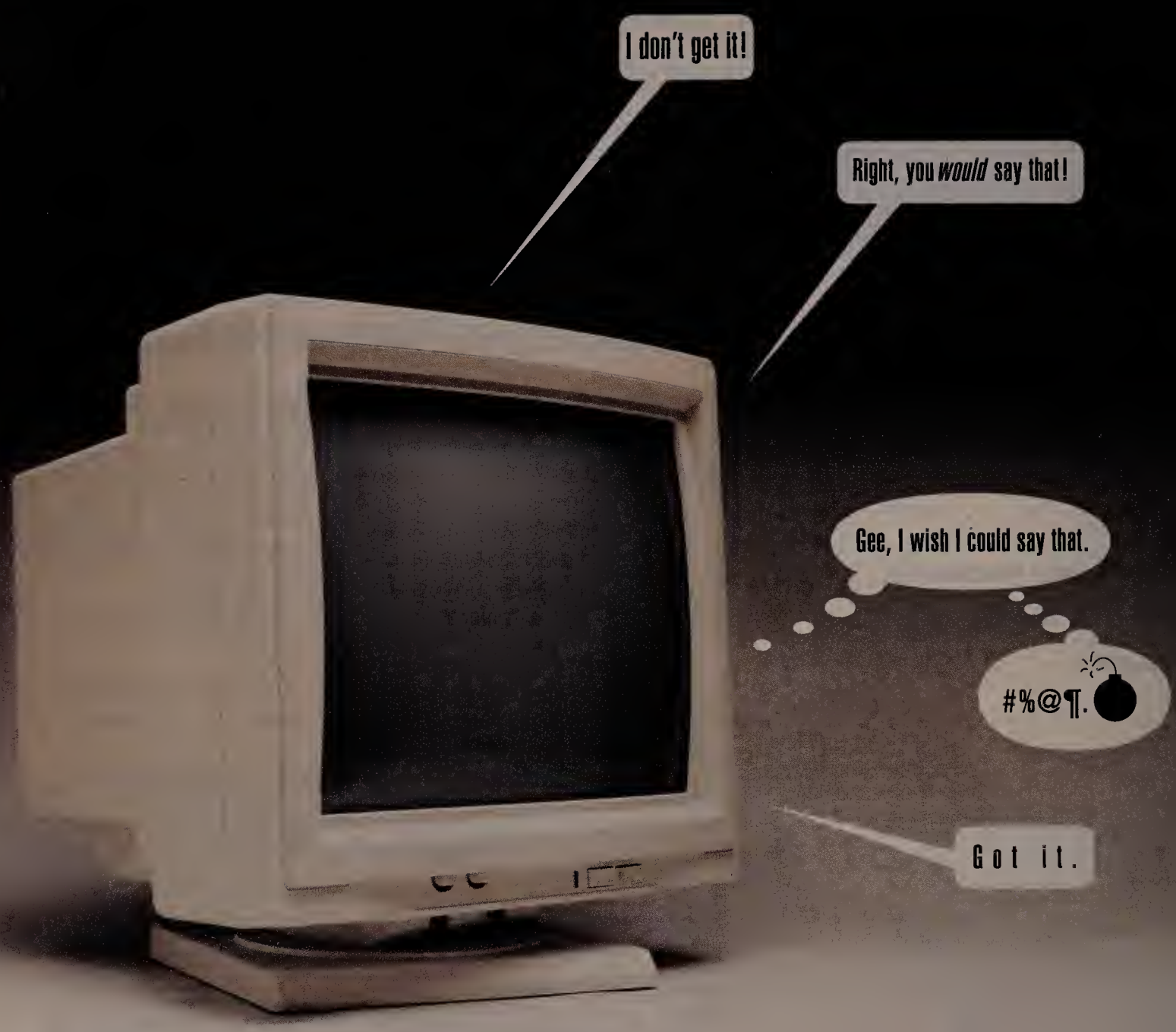
Bob Norton
St. Madison, Wisconsin

I agree with Mr. DuPrie that people will cling to what works. *ARC*—clumsy, slow, and illogical as it is—will continue to be the Chevrolet of the archiveware scene. The PC marketplace rewards not excellence, but being first on the scene.

Kas Thomas
Greenwich, Connecticut

(continues)

ANTHONY RUSSO



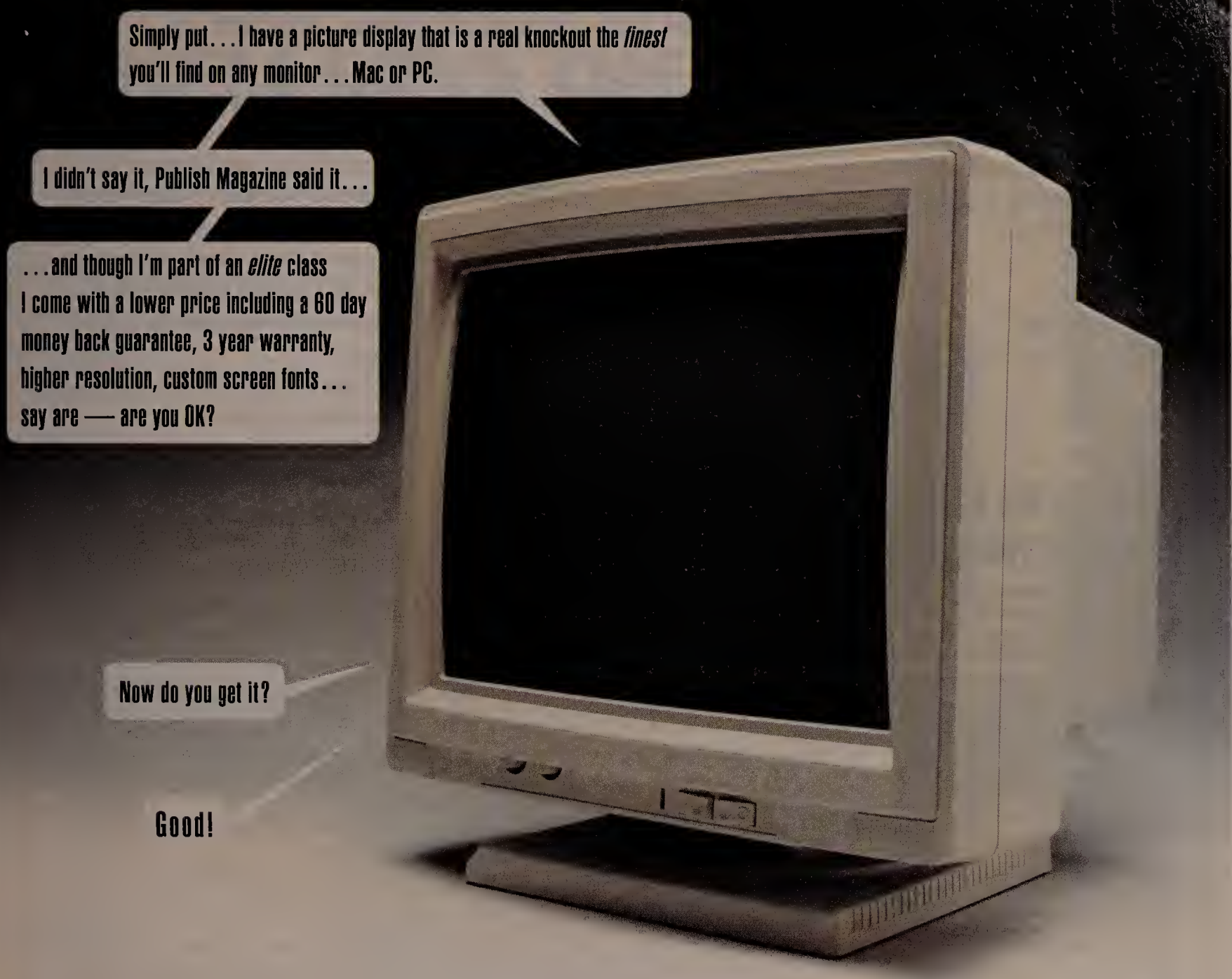
GET IT?

On your left, our competitor...for obvious reasons has asked us to conceal his identity.

On your right, we'd like you to meet our bold new Elite/1600™ monitor, a complete ultra high resolution 20-inch monochrome display system with a 1600 x 1280 pixel resolution.

The same resolution as the Sun-4 workstation monitor. A picture so stable and flicker-free it can only be called extraordinary. For you, this means drawings that are pin-point precise and razor sharp images that are perfectly aligned.

© 1989 Elite Microsystems Inc., Bensalem, PA



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It offers the highest quality two-page display system available for the IBM PS/2 Series, and IBM PC and compatible.

Each display system comes complete with a high resolution monitor, video interface card, and software drivers.

The Elite/1600™ is part of our extensive family of display products for the IBM compatible and Macintosh computers.

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Circle 80 on reader service card

What gratifies me is that I have finally found someone who might be interested in my collection of wide neckties and my kerosene-powered stereopticon.

Allan S. Joffe
Co-SYSOP
Warminster BBS
Dresher, Pennsylvania

Software Is the Solution

Just when you thought it was safe to buy that Model 70, here come IBM and Intel with a great reason to spend $3995 more ["Why You'll Want a 486," *Richard Landry,* September 1989]. There's no disputing the impact the new chip will have. But when will someone call for a reality check? What we need is decent software that won't force us to squander fortunes on hardware to run it. It can be done. *1-2-3* release 2.2 and *Desqview* can run on XTs with 640K of RAM. We need answers, not OS/2. Pass it on.

Lane Savage
Laurel, Maryland

Here's the PC Voice Mail system that can increase your productivity by over 9 weeks.

The average business person ***wastes*** 5 to 7* hours each week on the telephone. That's over 9 weeks a year of wasted time and profits. That's why you need Watson.

What Is Watson?
It's the $249 hardware and software system that turns your PC and telephone into an intelligent communications system that outperforms voice messaging systems costing thousands of dollars more.

Why Watson?
Because Watson invented the category of PC voice mail. Because *PC Magazine* selected Watson Version 1 as "Editor's Choice for Product of the Year in 1984." Because Watson Version 6.23 is a Hayes compatible modem (1200 or 2400 BPS) that runs completely in the background without interfering with other computing functions. Because Watson comes with a 60-day free support program. Because Watson has over 30,000 satisfied users. *And because over 45% of our sales come from user referrals!*

All This For Just $249.
With basic Watson you'll get a single or multiple user system that answers the phone; forwards messages to *any* phone, even pagers; provides private and public voice mailboxes; gives you a personal calendar and programmable alarms plus a dictation system with full featured voice editing. You'll get auto dialing, remote access operation and message retrieval. Plus a sortable phone book based on a Rolodex™ file card structure in which you can enter free form notes and do key word searches. And it's all yours for just $249.

Watson—Voice Information System (VIS)™ Option.
An English-like command language that allows you to customize voice messages, control message sequences with touch tones for both inbound and outbound response applications.

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To decide which Watson is right for you, *call our Demo Hotline. You'll hear an actual demonstration* and discover all the ways Watson can work for you.

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Try Watson for 30 days. If you aren't completely satisfied, return it for a full refund.

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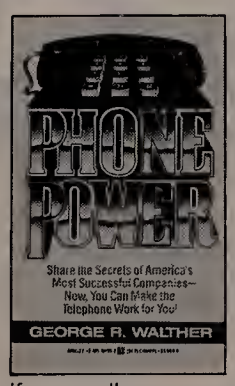
We'll send you a free copy of *Phone Power,* if you call before 12/31/89 and ask for extension 258. No order necessary. Over 200 pages of practical techniques for small business owners and company executives. Make your telephone and your time more profitable.



*George Walther, *Phone Power* (New York: Berkley Books, 1986).

Call on the power of **Watson**®
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8 Erie Drive, Natick, MA 01760-1313

Circle 63 on reader service card

Transfer Transgression

September's lead *Product Outlook* item on Zenith's MinisPort contains a glaring error. The notebook computer's ROM-based serial transfer program is identified as something other than *FastLynx.* This was definitely a case of mistaken identity. FastLynx LX—a modified version of Rupp Corporation's program—was developed especially for the MinisPort.

Byron Rupp
President
Rupp Corporation
New York, New York

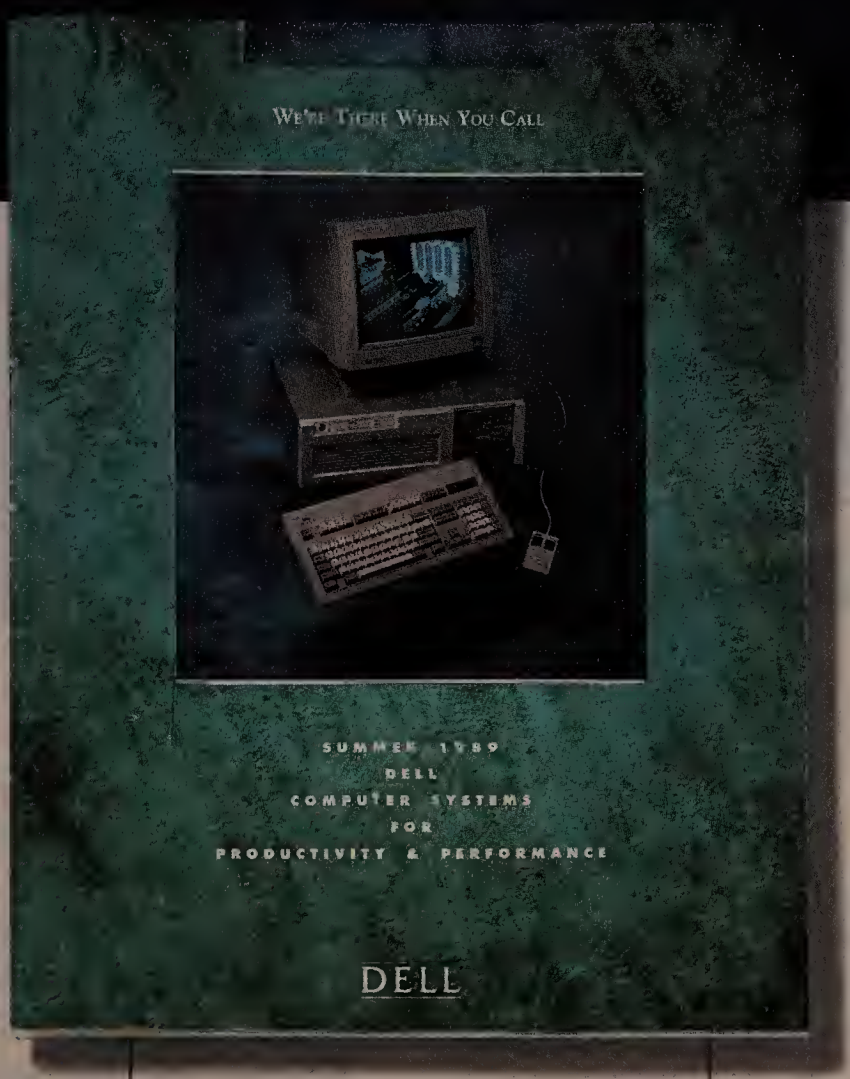
Get Out Those Calculators

It's time to get your math coprocessor recharged. July 1989's *Network Q&A* says that "the $2988 Panasonic LF-5000 holds 384MB on each $115 cartridge—a $7-per-megabyte value." Not by my math!

James Kaufman
Wellesley, Massachusetts

We erred on two counts. The Panasonic LF-5000 is listed at $2998, and the backup system cost is $8.11 per available megabyte (cost of drive plus cost of one cartridge divided by size of cartridge). This does not alter (continues)

SEND AWAY FOR YOUR VERY OWN COMPUTER STORE.



When you buy a computer, about 35% of your money goes to the store.

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Every 500 years or so, comes

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Johannes Gutenberg, 1454.

Introducing the new IBM LaserPrinter: 25% faster printing, advanced features and a revolutionary streamlined design.

A printer that can raise your productivity as much as the new IBM LaserPrinter doesn't come along every day.

Not only does its advanced design make it outperform the HP LaserJet Series II, which up till now has been the benchmark in laser printing. But also, its advanced design gives the IBM LaserPrinter a dramatically new, more space-efficient shape.

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We just advanced the art of laser printing a full 25%. The new IBM LaserPrinter gives you state-of-the-art print quality a full 25% faster than its main competitor.

Why other printers can't follow in our footsteps. The advanced design and engineering of the IBM LaserPrinter give it a footprint that's 33% smaller than its main competitor's. And that 33% gives you more usable workspace.

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an exceptional printer
along.

The new IBM LaserPrinter, 1989.

		IBM LaserPrinter	HP LaserJet Series II
Speed	✓	up to 10 ppm	up to 8 ppm
Footprint	✓	291 sq. in.	432 sq. in.
Paper-handling options	✓	500 sheets, 75 envelopes	15 envelopes*
Collates letters/envelopes	✓	yes**	no
Plotter emulation	✓	standard	optional
Resident fonts	✓	10	6
Font card size***	✓	credit card	"8-track" cassette
Standard weight	✓	33 lbs.	50 lbs.
Parts***	✓	400	1000
Dots per inch		300 x 300	300 x 300
Printer emulation	✓	IBM, HP compatible	HP compatible
Printer engine		IBM	Canon
List price	✓	$2,595	$2,695

*HP envelope tray replaces standard paper tray **With paper-handling options ***Approximate

It also takes the lead in paper-handling options by offering automatic collating of letterheads, second sheets and envelopes.**

Plus more ample storage capacity.

See history in the making by having your IBM Authorized Dealer or IBM marketing representative demonstrate the exceptional new IBM LaserPrinter. Locate your nearest dealer by calling 1 800 IBM-2468, ext. 194.

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When it comes to desktop publishing, only Ventura handles the long and short of it.

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Short documents are a snap with Ventura's broad compatibility, easy format controls, and superior speed. As for long documents, its automatic table of contents, cross-referencing, global pagination, and anchored illustrations make them just as easy. And with either, Ventura's networking capability enhances group productivity.

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Team Xerox.
We document the world.

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Circle 253 on reader service card

the system's relative position in the review: It is the second least expensive, megabyte for megabyte. PC World *regrets the errors. —Ed.*

Backing Up on Tape Cartridge

David Ferris says that "most backup tape cartridges wear out after 50 full backups" [*Network Q&A*, July 1989]. We back up our tapes more times than this, and we have never had a problem verifying or restoring. A technician with whom I spoke said 3M tapes are warranted for 5000 passes. Who's right?

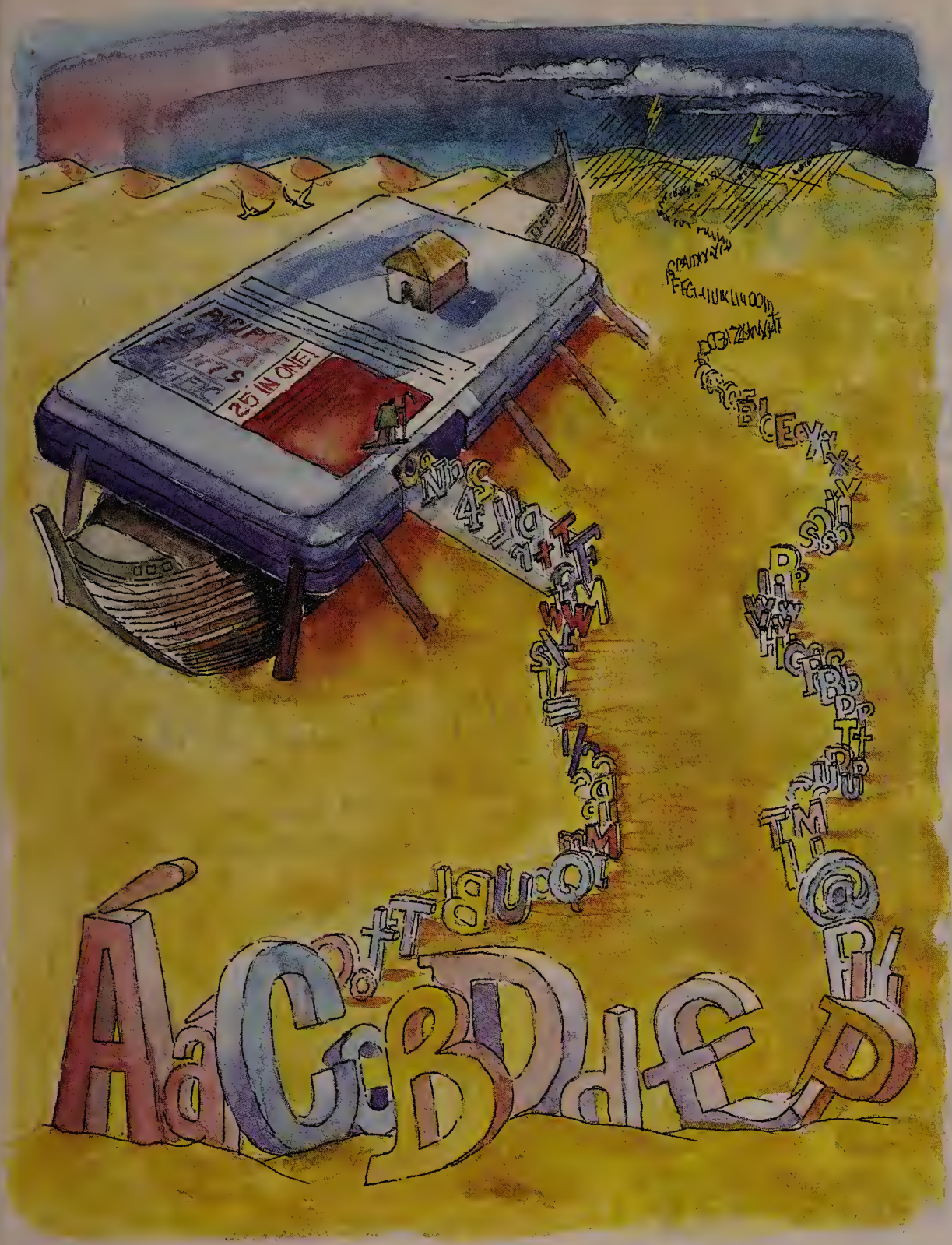
Michael Henderson
Director of Management Information Systems
Quads
Frederick, Maryland

My estimate of a 50-pass life expectancy for tapes was too conservative. After talking further with product development engineers and tape drive manufacturers, I now rate the average life span of quarter-inch tape at 350 passes, and for 8mm tape, 500 passes. Data integrity may be maintained beyond this number of backups, but going much beyond these limits puts your data at risk. —David Ferris

Turbo-Charged Mouse

Like most comparisons of Pascal compilers, your review in September 1989's Programming Special Report notes that *Turbo Pascal* lacks *Quick Pascal*'s mouse support. However, there is a solution for Turbo users. Borland's BPROGA forum on CompuServe offers a program called TPRAT5 for downloading.

(continues)



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25 Cartridges in One! is ideal for almost any type of application—like word processing, presentation graphics, and spreadsheet publishing. With 19 printer drivers included, there's increased support for most of the popular software packages.

Now that it's loaded with 172 fonts and 20 symbol sets, go ahead—print up a storm.

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Circle 223 on reader service card

XEROX

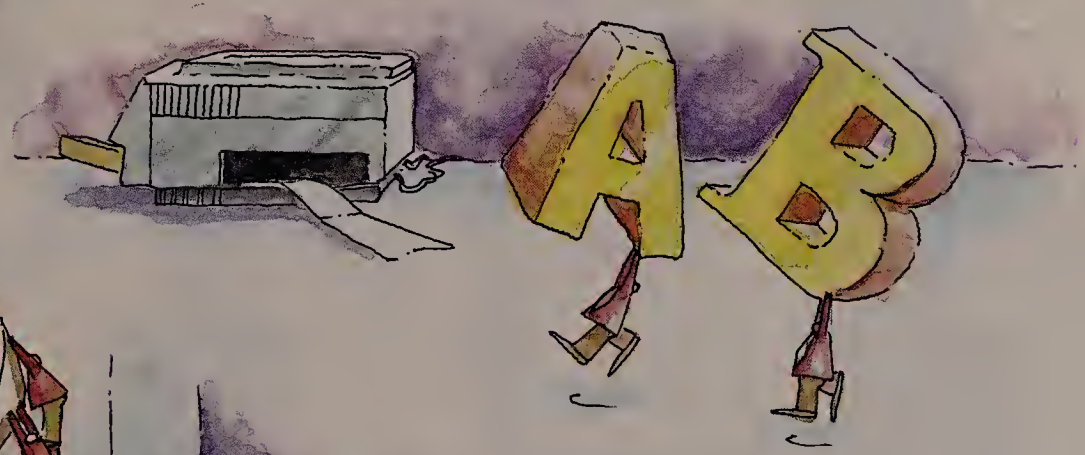
**The trouble with most desktop publishing systems is you have to make changes page by page by page by

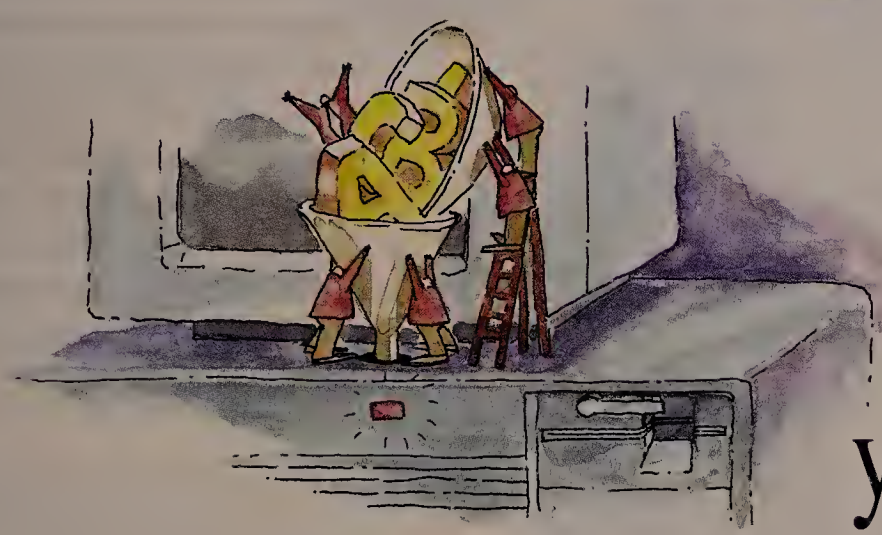
It's now fast and easy to print Headline Fonts

HP LaserJet IIP Compatible

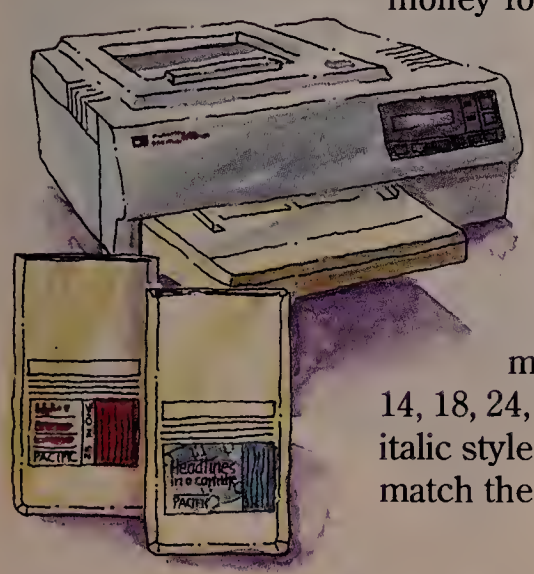
without waiting

downloading





or filling up your hard disk.



Spending a lot of time, effort and money fooling around with downloadable soft fonts? Don't give up. Just plug in Pacific Data Products' *Headlines in a Cartridge*™.

Immediately, you gain access to 18 high-quality Helv and Tms Rmn style fonts. And they come in the most widely used display sizes—14, 18, 24, 30, 36, and 48 points. In bold or italic styles. No other font cartridge can match these point sizes.

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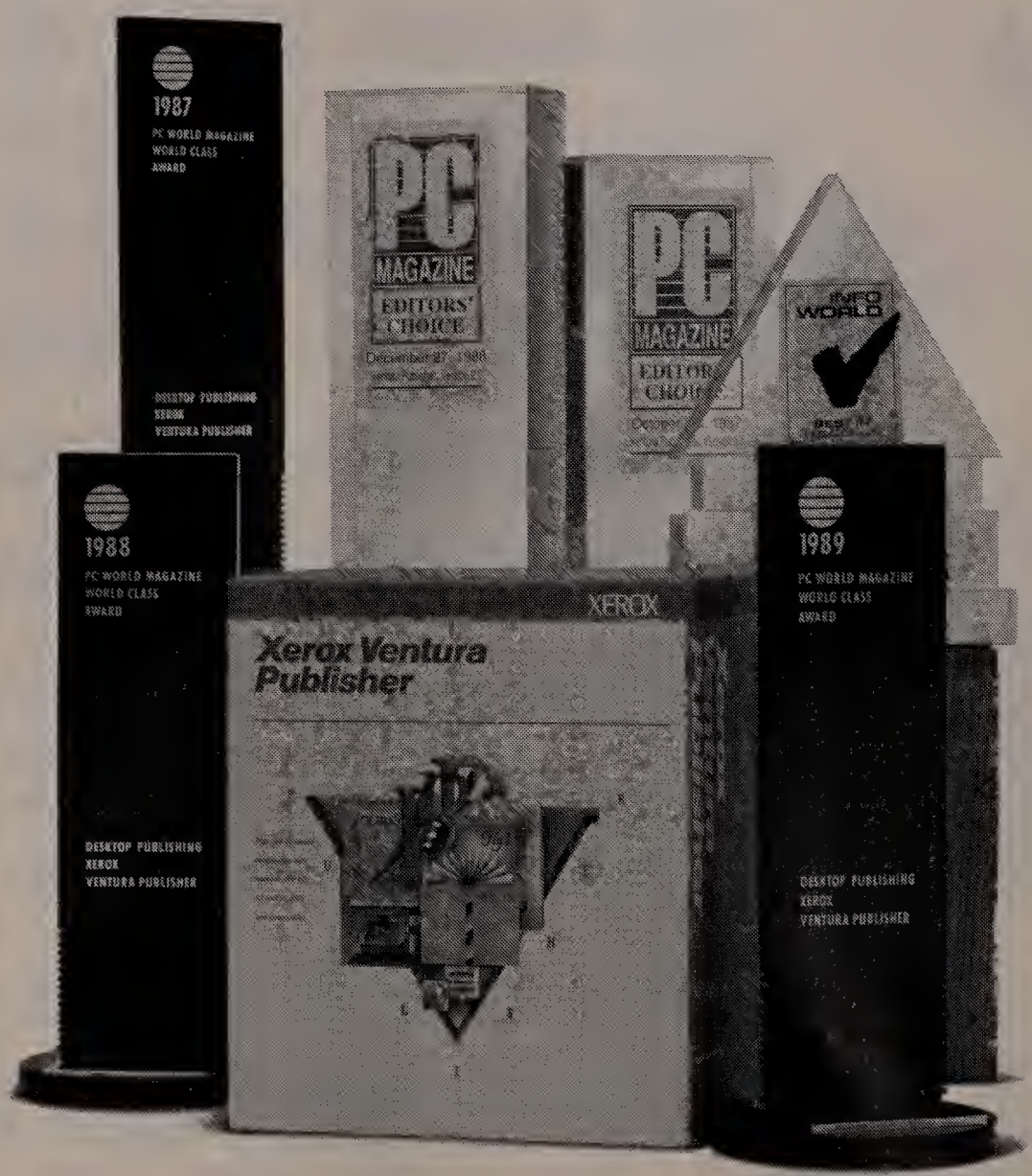
XEROX

You win some, and you win some.



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Circle 253 on reader service card

edge a file you want to transfer and freezes during some ASCII and XMODEM transfers under *Windows 2.1*. What we failed to make clear is that the bug was *Windows*'—not *DynaComm*'s—and that the necessary patch was available from Microsoft. One blatant mistake: *DynaComm 2.0* does indeed show file transfer progress. *PC World* regrets the errors.

Second Look

In our October 1989 roundup "Seven Printers With Business Sense," the IBM Proprinter X24E we tested had a defect that drastically reduced the unit's performance. The fully operational unit turned out to be faster than any other printer in the roundup; unfortunately, follow-up testing occurred too late to allow us to amend the review. The unit's speed, along with several other compelling features, clearly earns the X24E a PC World Best Buy.

EXECUTIVE SUMMARY

IBM Proprinter X24E

24-pin dot matrix printer

BEST BUY

Despite a fairly high price, the X24E's speed, great print quality, and excellent paper handling add up to a Best Buy.

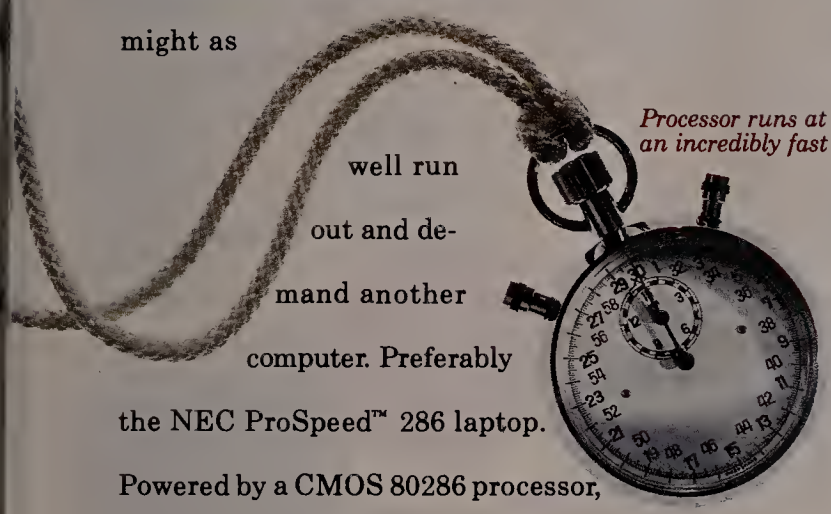
	POOR	FAIR	GOOD	EXCELLENT
Print quality				●
Speed				●
Paper handling				●
Front panel controls			●	
Typographic features			●	
Overall value				●

Reader service no. 735

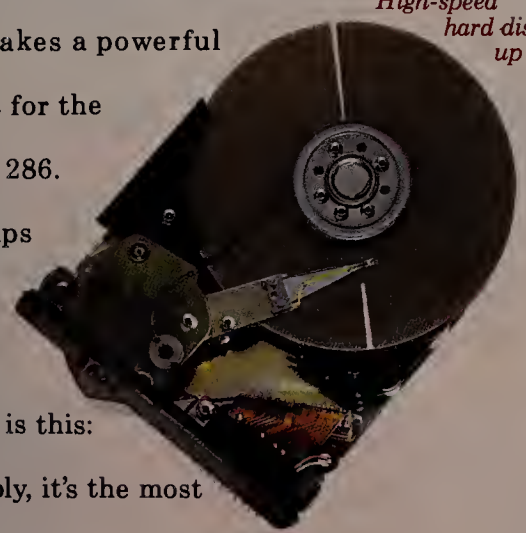
To send correspondence, please see How to Contact PC World, page 4. ●

An awesome display of power.

Undoubtedly, the most important element of a laptop computer is power. After all, if you can't run demanding applications, you might as well run out and demand another computer. Preferably the NEC ProSpeed™ 286 laptop. Powered by a CMOS 80286 processor, running at a blinding 16MHz, the ProSpeed can accommodate the most sophisticated applications. It's equipped with one megabyte of memory that's expandable to five. And it comes with either 20 or 40 megabyte high-speed hard disk drives. There's even a model with a 100 megabyte drive for data-intensive applications. Now, all this makes a powerful statement for the ProSpeed 286. But perhaps the most powerful statement is this: quite simply, it's the most powerful 286 laptop you can buy.



Processor runs at an incredibly fast 16MHz.



High-speed hard disk— up to 100 MB.

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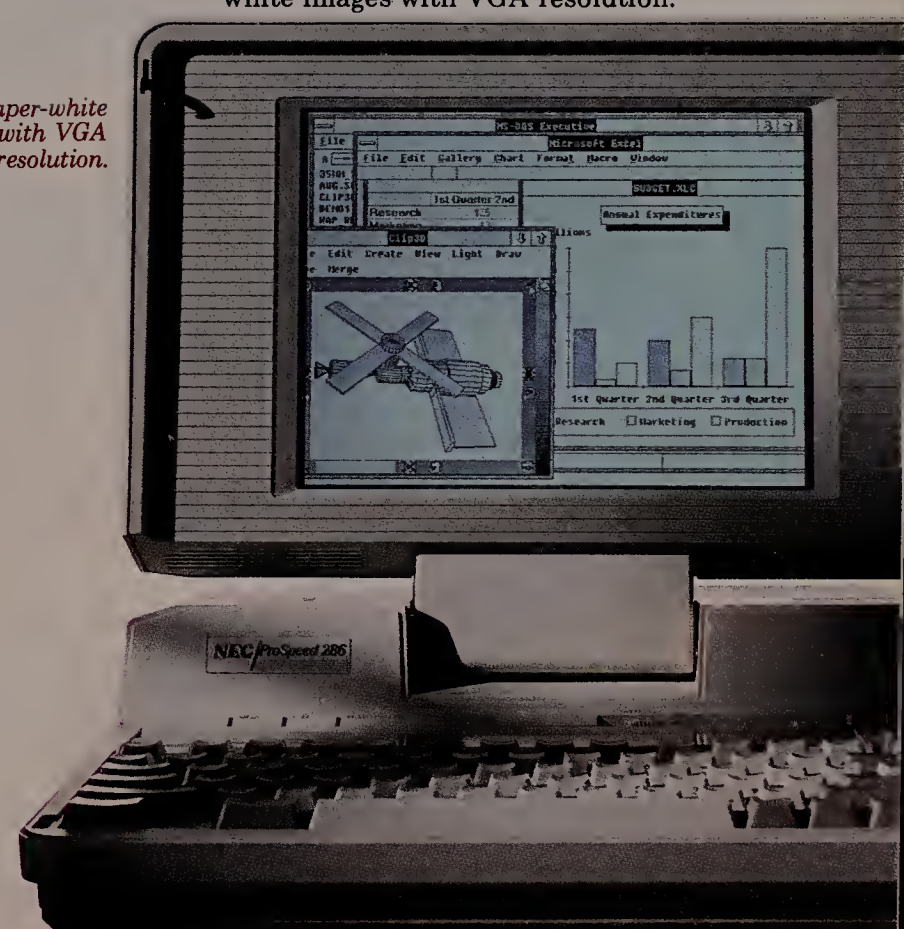
An awesome power of display.

Undoubtedly, the most important element of a laptop computer is its screen. After all, if what you're looking at isn't very clear, then clearly you need another computer. Preferably the NEC ProSpeed 286. Engineered with an advanced screen technology, the ProSpeed gives you crisp, bright, black-and-white images with VGA resolution.



Paper-white screen with VGA resolution.

And with more and more people moving towards advanced graphics-oriented applications, the case for the NEC ProSpeed 286 becomes even clearer.

ProSpeed™ 286

Call 1-800-826-2255 for literature and 1-800-FONE-NEC for technical advice. In Canada, call 1-800-268-3997.

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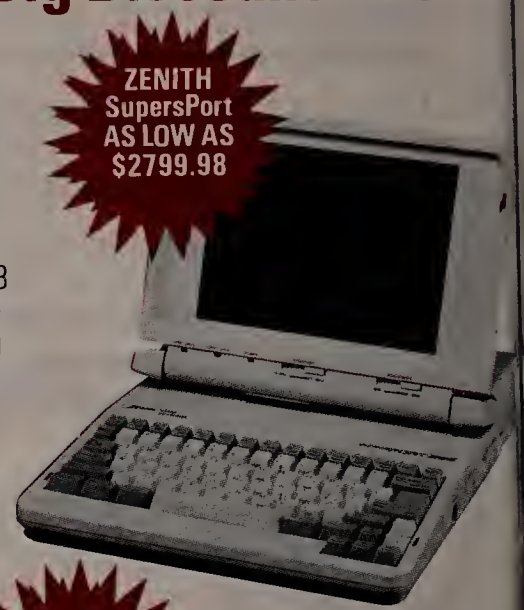

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TOSHIBA T1000 Truly affordable, truly portable–weighs less than 7 lbs.–and IBM compatible! Expandable to 640KB of memory. Built-in 720KB diskette drive for generous storage capacity with 3½" diskettes. Crisp and bright supertwist LCD display with 640 x 200 bit-mapped graphics. Wt. 6.4 lbs.

NEC ProSpeed™ 286 The fastest 16 MHZ 80286 battery-powered portable laptop computer on the market. High performance for the most demanding applications and graphics. Up to 5MB of internal main memory. High-speed 20, 40 or 100MB hard disk options. Advanced VGA display. Brilliant black and white Monograph™ CTN screen. Wt. 15 lbs. with AC adaptor.

NEC ProSpeed AS LOW AS $3749.88

SHARP MZ-100 AS LOW AS $1199.99

ZENITH SupersPort 286 This battery-powered portable laptop computer offers solid performance 12/6 MHZ 80286 capabilities. 1MB of RAM expandable to 2MB. Available with one 3½" floppy drive and either 20MB or 40MB hard drive. Backlit supertwist LCD CGA display with 640 x 400 resolution for crisp text. Wt. 14½ lbs. with detachable NiCad battery pack–runs up to 4 hrs.

SHARP MZ-100 Fast 10MHZ battery-powered portable laptop is XT-compatible with 640KB of memory. Expandable to 1MB of memory. Two 3½" 720KB floppy disk drives. 5¼" floppy disk drive option. High definition backlit supertwist LCD CGA display with 640 x 400 resolution for clear text and graphics. Wt. 10.8 lbs. without AC adaptor.

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According to *Computer Shopper* magazine (September, 1989), laptops are the "hot marketplace right now." So if you've been considering a laptop, Quill's trained staff of Computer Product Specialists can assist you. They will take the time to talk with you and together you can decide which laptop is right for you.

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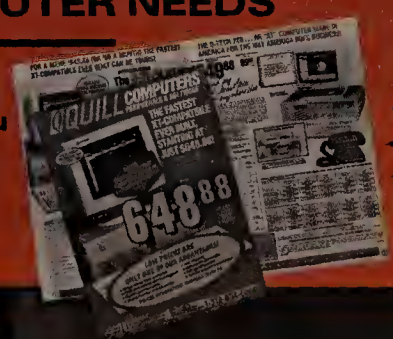

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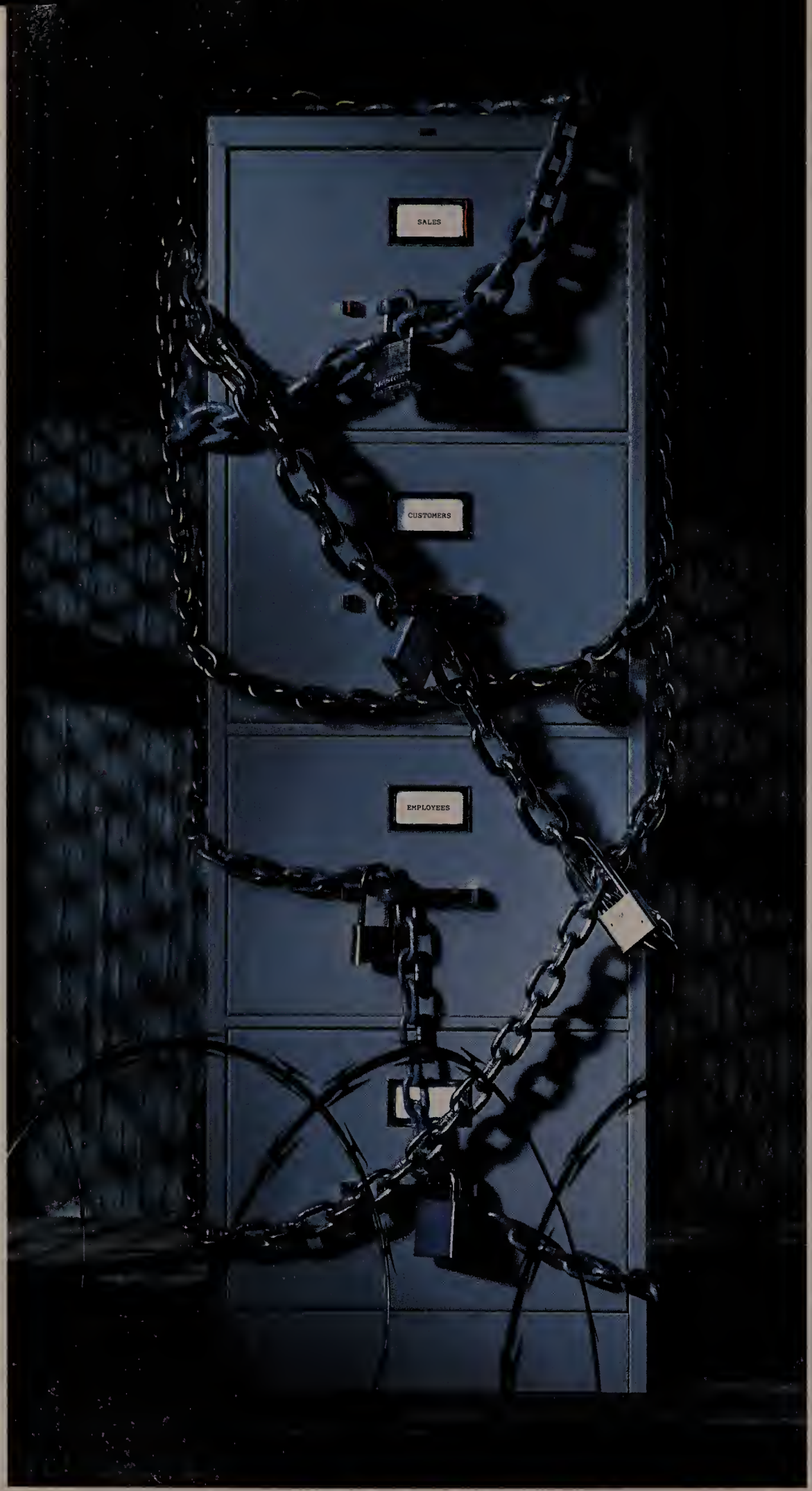

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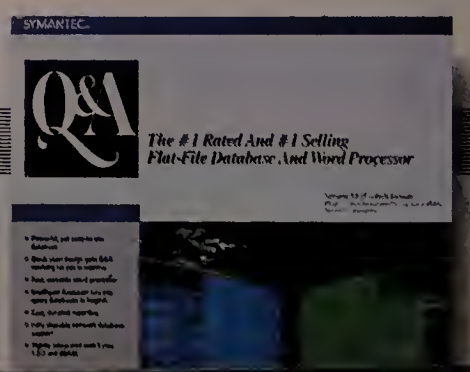

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THE HELP SCREEN

PC World offers answers and advice at every level

Learn how to care for floppy disks and try a fix for read errors, customize DOS colors, use QuickBASIC to put file names into variables, and master control codes.

Karl Koessel

Floppy Disk Care

Q. *On the back of many brand-name floppy disk sleeves are icons that warn about temperature extremes and magnetic fields and caution against bending, clipping, or touching the disk. Can you give me some examples of real-world situations that I should avoid?*

Rachel Bergerman
Atlanta, Georgia

A. Floppy disks, especially the 5¼-inch type, are vulnerable to all sorts of everyday traumas. Heat damage can occur from leaving disks on windowsills and TVs, in cars, on top of monitors and system units, and even atop shelving that houses electric lighting underneath (like some modular office furniture).

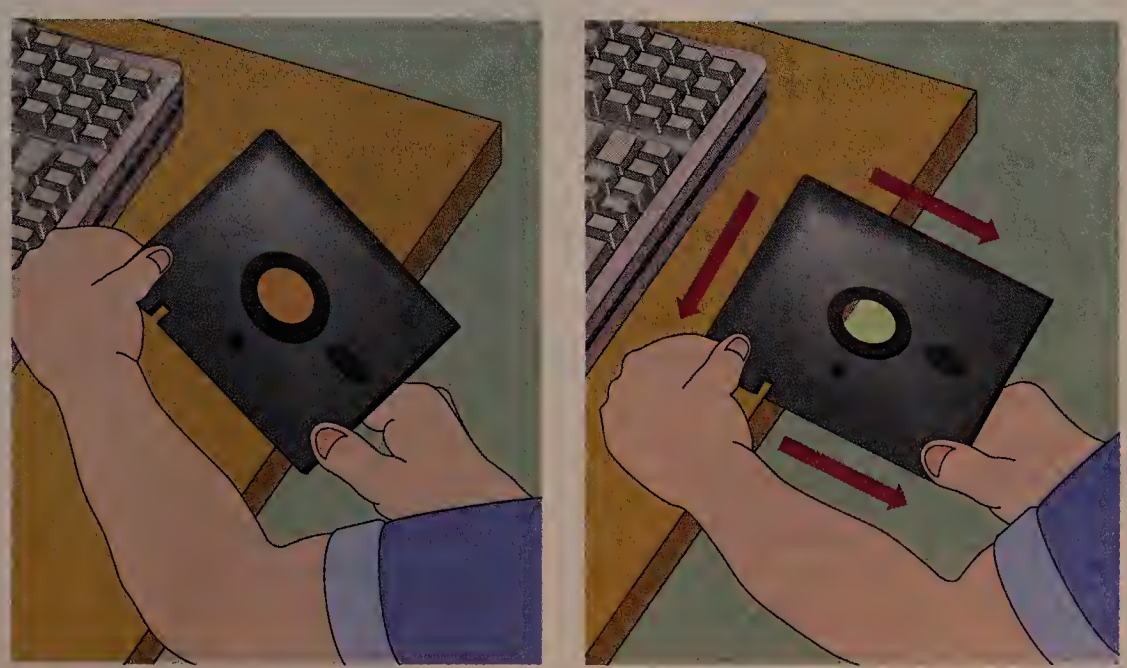
Bending or paper clipping a disk jacket can crush its side walls and prevent the disk from spinning freely. The same damage can occur if you store a disk inside a book, use a cheap disk mailer, or pack a floppy in your briefcase. Fortunately there's a simple cure: Grip two adjacent corners of the disk and, pressing gently, slide one edge of the disk perpendicularly against the edge of a desk to square up the side (see **FIGURE 1**). Repeat for the other three sides.

Magnetic fields often go unnoticed. But there's one behind your monitor; below a ringing telephone; in stereo, headphone, walkie-talkie, and portable telephone speakers; in magnetic containers that hold paper clips; and around electric cables and cords. Even a small magnetic field can play havoc with the information on your disks. At one office, a tiny magnet on a charm bracelet ruined dozens of disks. Then there's the story of the person who was so worried about the airport X-ray machine that he handed his disks to the security guard—right past the magnetic fields at the back of the detector. (X rays don't hurt disks—just lay them flat on the conveyor belt.)

Touching the surface of a disk can cause damage by contaminating its sensitive media. The oil deposited by your fingers may in turn sully the drive's read/write heads and thereby damage the next disk as well.

Dropping books or other heavy objects onto a disk or writing on it with a hard-tipped

(continues)



ANTHONY RUSSO

KEITH BAUMANN

FIGURE 1: If your floppy disk doesn't spin freely, use the edge of a desk to reform the disk jacket's side walls.

TABLE 1

ANSI.SYS Colors

Color the text and background of DOS by using the PROMPT command with these code values.

Color	Foreground code	Background code
Black	30	40
Red	31	41
Green	32	42
Yellow	33	43
Blue	34	44
Magenta	35	45
Cyan	36	46
White	37	47

pen or pencil can mar disk media. But simply pinching a disk too hard (when peeling off an old label, for example) can cause the same damage. Always hold a disk at its corners.

Now that you know how to better avoid problems, here's one you can't prevent: Disks eventually will wear out from simple use. You should always have more than one copy of important data.

The Color of DOS

Q. *Thanks for the patch that makes ECHO OFF the default ["Now You See It, Now You Don't,"* The Help Screen, *April 1989]. Is there one that will let me change my EGA system's DOS text to cyan on black?*

Harry A. Borley
Lodi, New Jersey

A. Don't patch for color; use ANSI.SYS (from your DOS disk), which takes up less than 2K. Assuming that ANSI.SYS is in drive C:'s \DOS directory, add the line DEVICE = C:\DOS\ANSI.SYS to the hard disk's CONFIG.SYS file. (If you boot from a floppy, use DEVICE = ANSI.SYS, and make sure that ANSI.SYS exists on your boot floppy.) Then add the line PROMPT $e[*ff*;*bb*m$p$g (where *ff* is the 2-digit code for the foreground or text color and *bb* the code for the background) to your AUTOEXEC.BAT file, and reboot. You can try out different color combinations by using the code values in **TABLE 1**. Insert ;1 before the *m* in the PROMPT line if you want brighter text.

QuickBASIC Variable File Names

Q. *I know the* QuickBASIC *statement FILES "*.FIL" will display the names of data files in the current directory, but how do I capture those file names into variables so my program can open them?*

David Herron
Atherton, California

A. It's not difficult. **LISTING 1** shows one way. It assumes that there's room on the default drive for a small temporary file and that if there's a file named $#TEMP@!.&^_, you don't need it. (There's no error checking in this example; add your own, if needed.)

The program uses SHELL to issue a DOS command that redirects DIR's output into the temporary file. It then counts the number of lines in that file so that a string array can be properly dimensioned. The first four lines of the DIR listing don't have file names; they're read into a dummy variable simply to move the file pointer to the fifth line, where the file listing actually begins. Then the lines are read into the array variables, the temporary file is killed, and the array variables are trimmed so that each retains only a file name.

(continues)

```
EXT$ = ".FIL"                          'Specify file name extension
DIRFILE$ = "$#TEMP@!.&^_"              'Specify temporary file name
SHELL "dir *" + EXT$ + ">" + DIRFILE$  'Use DOS's DIR to create file
OPEN DIRFILE$ FOR INPUT AS 1           'Count up the number of lines
COUNT = 0                              'First set counter to zero
DO UNTIL EOF(1)
   INPUT #1, DUMMY$                    'Use same dummy variable, since
   COUNT = COUNT + 1                   ' you're only counting lines
LOOP
CLOSE 1                                'Close file to reset file pointer
COUNT = COUNT - 5                      'Don't need first 4 and last line
OPEN DIRFILE$ FOR INPUT AS 1
FOR I = 1 TO 4                         'Read in 4 lines so file pointer
   INPUT #1, DUMMY$                    ' points to first file name
NEXT
DIM FILE$(COUNT)                       'Dimension string array
FOR I = 1 TO COUNT                     'Read each line containing a file
   INPUT #1, FILE$(I)                  ' name into an array variable
NEXT
CLOSE 1
KILL DIRFILE$                          'Delete temporary file
FOR I = 1 TO COUNT                     'For each array variable, grab
   FILE$(I) = LEFT$(FILE$(I), 8)       ' the first 8 characters only,
   FILE$(I) = RTRIM$(FILE$(I)) + EXT$  ' trim off spaces, add the
   PRINT FILE$(I)                      ' extension, and display result
NEXT
```

LISTING 1: This short QuickBASIC routine learns a directory's file names and places each one into a variable.

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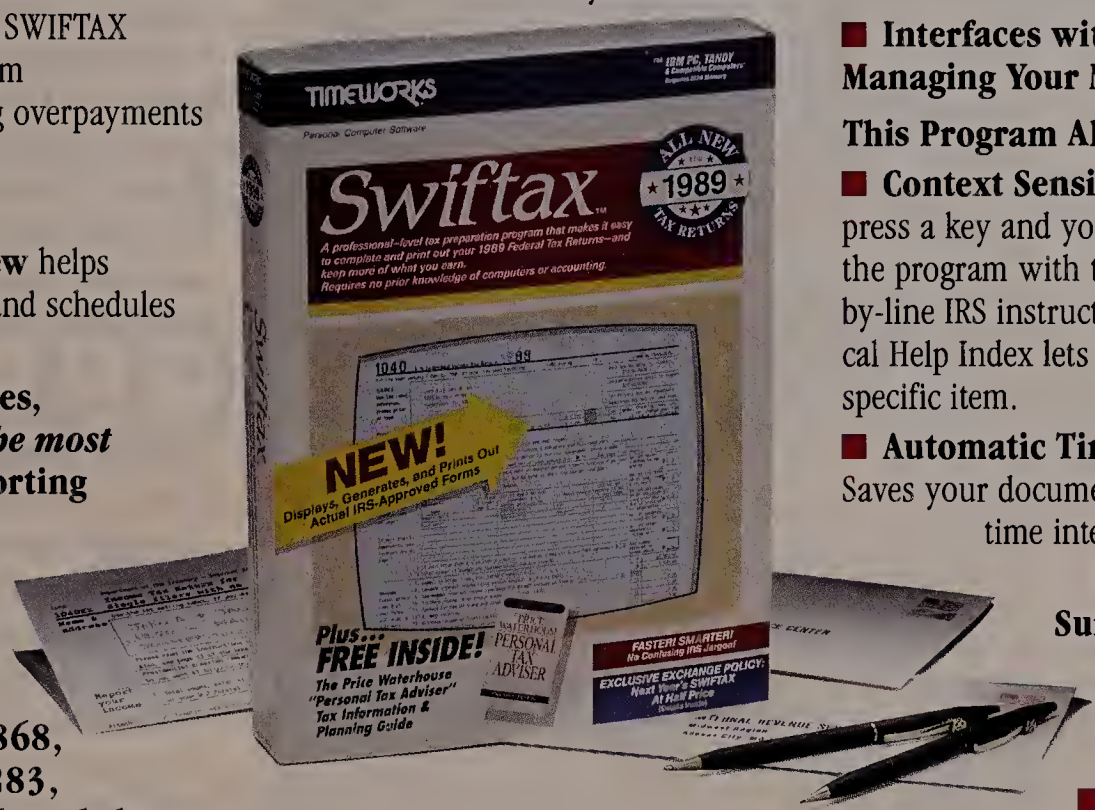

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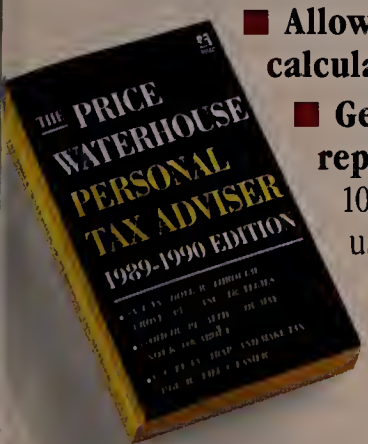

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TABLE 2

Control Codes

<Ctrl>-key combinations represent the first 32 ASCII codes, which originally controlled peripherals. Now the IBM PC also uses them to display special characters.

ASCII Code Dec	ASCII Code Hex	Control abbreviation and function		IBM character	DOS display
0	0	NUL	Null	(none)	^@[1]
1	1	SOH	Start of heading	☺	^A
2	2	STX	Start of text	☻	^B
3	3	ETX	End of text	♥	^C (Break)[2]
4	4	EOT	End of transmission	♦	^D
5	5	ENQ	Enquiry	♣	^E
6	6	ACK	Acknowledge	♠	(none)
7	7	BEL	Bell	•	^G
8	8	BS	Backspace	◘	backspace
9	9	HT	Horizontal tab	○	tab
10	A	LF	Linefeed	◙	linefeed
11	B	VT	Vertical tab	♂	^K
12	C	FF	Formfeed	♀	^L
13	D	CR	Carriage return	♪	enter
14	E	SO	Shift out	♫	^N
15	F	SI	Shift in	☼	^O
16	10	DLE	Data link escape	►	printer toggle[3]
17	11	DC1	Device control 1	◄	^Q (or resume)
18	12	DC2	Device control 2	↕	^R
19	13	DC3	Device control 3	‼	pause (or ^S)
20	14	DC4	Device control 4	¶	^T
21	15	NAK	Negative acknowledge	§	^U
22	16	SYN	Synchronous idle	▬	^V
23	17	ETB	End transmission block	↨	^W
24	18	CAN	Cancel	↑	^X
25	19	EM	End of medium	↓	^Y
26	1A	SUB	Substitute	→	^Z[4]
27	1B	ESC	Escape	←	\ (^[)[5]
28	1C	FS	File separator	∟	^\
29	1D	GS	Group separator	↔	^]
30	1E	RS	Record separator	▲	^^
31	1F	US	Unit separator	▼	^_

[1]Only by pressing <F7>; <Ctrl>-@ produces ^C (Break).
[2]Same as <Break> (<Ctrl>-<Pause>; on pre–101-key keyboards, <Ctrl>-<Scroll Lock>).
[3]Same as <Ctrl>-<Print Screen> (turns on and off echoing of screen characters to printer).
[4]Also by pressing <F6>; used as ASCII end-of-file marker.
[5]At the DOS command line, pressing the <Esc> key displays a backslash, followed by a new, blank command line. However, the Escape character is often displayed as ^[.

Controlling Interest

Q. *I know that certain <Ctrl>-key combinations are meaningful to DOS—I use <Ctrl>-Z as an end-of-file marker in batch files, and I generally use <Ctrl>-C in lieu of the <Break> key. But I've discovered (quite by accident) that some other <Ctrl>-key combinations can be used on the DOS command line and, sometimes, in programs. Some combinations produce unusual characters. Some act like noncharacter keys, such as <Enter> (<Ctrl>-M) or <Backspace> (<Ctrl>-H). Some appear to do nothing at all. But most often, they display the character pressed, preceded by a caret.*

Are any of these key combinations useful? Why are they there in the first place?

David Lopez
Roseville, California

A. In the days before CRT video displays (and personal computers), the first 32 ASCII codes were defined as control codes (see **TABLE 2**) for controlling Teletype terminals and other then-current peripherals. (For example, sending a Control S to the paper-tape reader would pause it, and sending Control Q would restart it.) The codes were named Control @, Control A, Control B, and so on, because adding 64 (decimal) to a control code value gives the ASCII code value for the associated character (@, A, B, ..., Z, [, \,], ^, and _). Those names are abbreviated by prefixing the character with a caret, as in ^A.

With the advent of PCs and CRTs, many of these codes, being roughly equivalent in function, were used to control monitors and other modern peripherals. For example, pressing <Ctrl>-S pauses the scrolling of a directory listing or a file; pressing <Ctrl>-Q restarts the scrolling. Note, however, that in your PC, the keyboard simply sends key-scan codes to the system. It is up to the BIOS's keyboard service to decide whether to perform some action or to pass the keystrokes to DOS. DOS then decides whether to perform some action, pass the keystrokes to a running application, or, if no application is running, display a character. For example, <Ctrl>-I yields an action (tab), but <Ctrl>-A produces the characters ^A. (Note that although two characters appear,

(continues)

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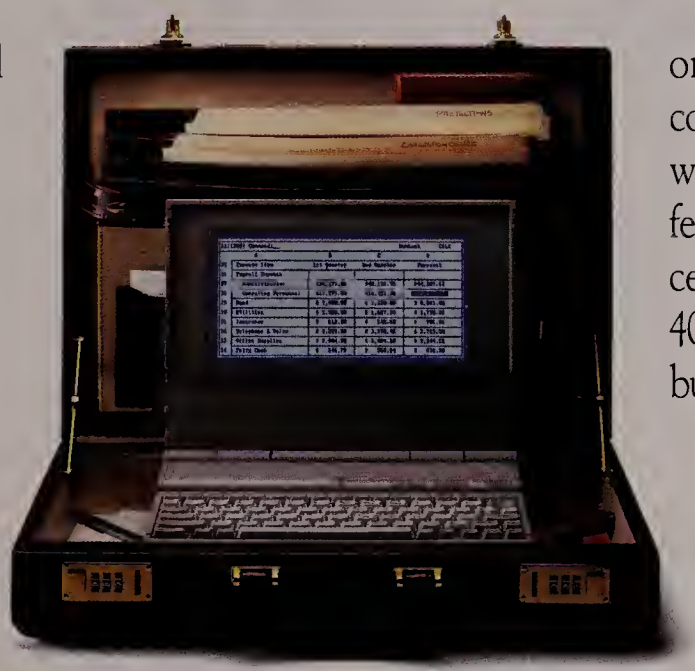

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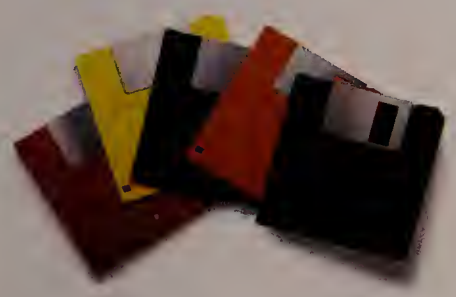

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they are treated as one by the <Backspace> and cursor keys because they represent a single ASCII code.) The DOS Display column of **TABLE 2** shows whether DOS displays a character, takes some action, or does both. (Your PC may behave differently, depending on its BIOS revision.)

You've noticed that some <Ctrl>-*key* combinations duplicate the functions of certain keys. (Some combinations are only similar; for example, <Ctrl>-S is like the <Pause> key, except that it may be pressed again to restart a paused action or pressed three times consecutively to display ^S.) But control codes can also be used to control other devices. For example, entering ECHO ^L >PRN (where ^L is produced by pressing <Ctrl>-L) sends a formfeed to the printer; ECHO ^O >PRN turns on compressed-print mode on Epson printers and compatibles; ECHO ^G sounds the PC's speaker (useful in batch files for getting the user's attention); and ECHO ^@ (where ^@ is produced by pressing <F7>) enables batch files to display a blank line regardless of DOS version.

Another use of <Ctrl>-*key* combinations is to produce the characters that IBM has assigned to the first 32 ASCII codes. Many of the characters require a program to display them on screen, but try entering ECHO ^K and ECHO ^L.

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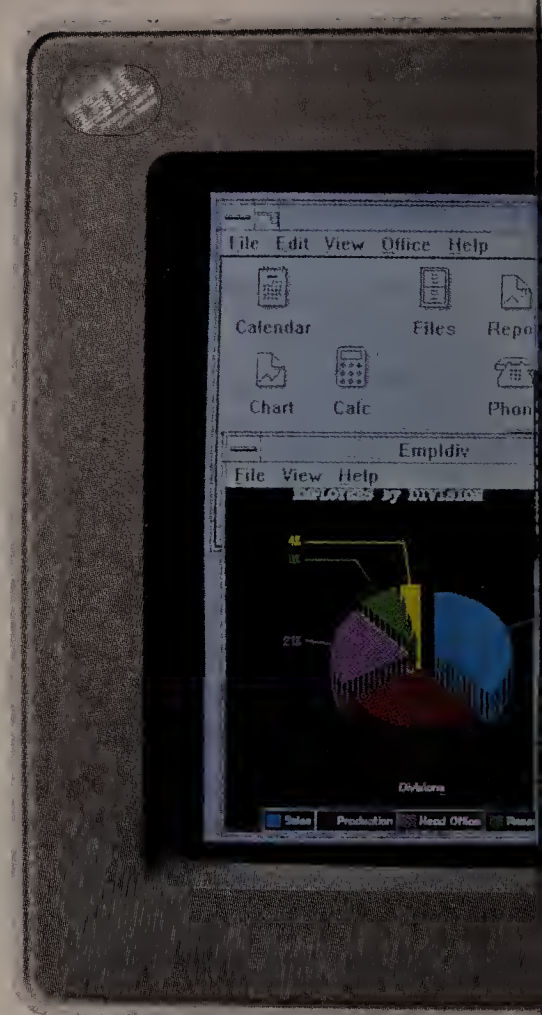

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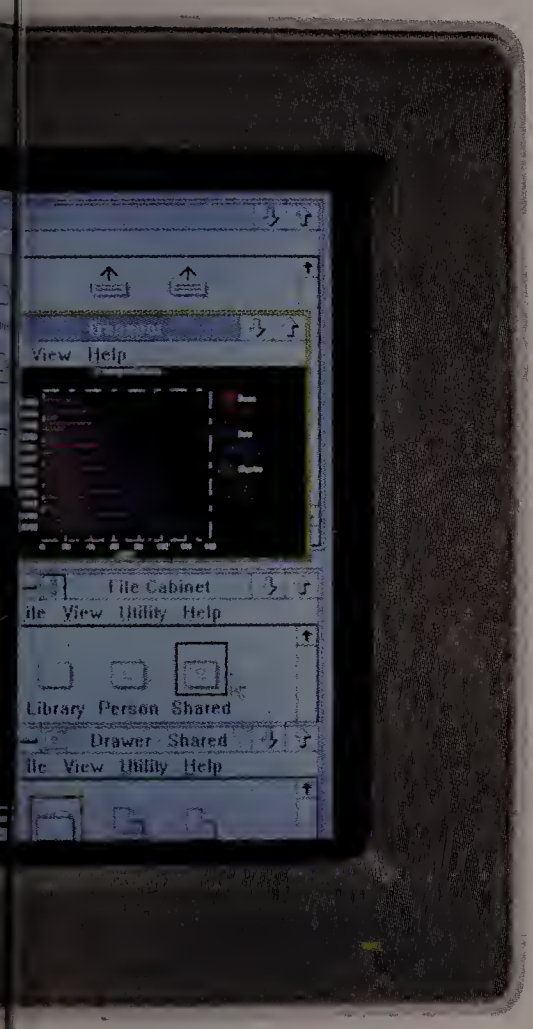

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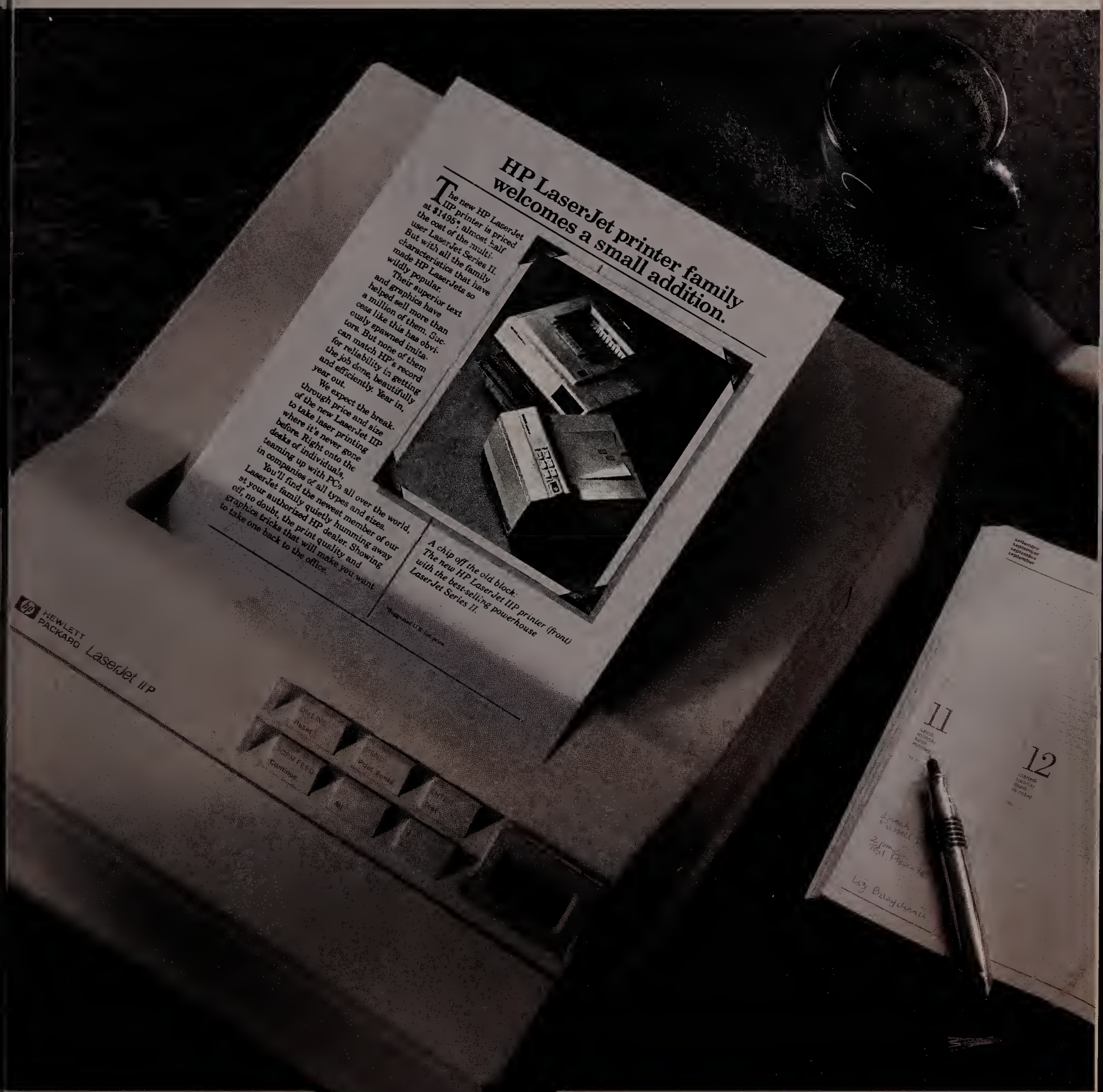

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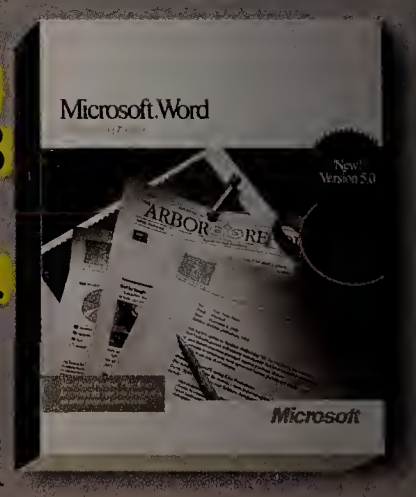
To see what they did, call (800) 521-1261, Dept. K13 for a free demo of Microsoft Word 5.0.



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WINDOWS JOURNAL

Firsthand dispatches from the Windows front

Three new Windows products show that for managing personal information, graphics and multitasking make a big difference.

Stewart Alsop

If you're like me, you've read an endless number of articles about an amazing new kind of software called personal information managers (PIMs). These articles usually talk in glowing terms about programs like *Agenda*, *Who What When*, *ACT*, *GrandView*, and *Ize*, all of which claim to be able to organize your work like it's never been organized before. But you're probably already bored with this stuff because you can't quite imagine how these programs actually work.

In fact, the problem with many of these programs is that you must adopt the programmer's way of organizing information. Programs like *Who What When* and *ACT* decide in advance what functions are available and exactly how they work. Other programs, like *Agenda* and *GrandView*, give you a set of tools to construct your own methodology. The first type of program is easier to use and faster to learn. The second is more functional because it can be customized. But neither approach has been particularly successful, primarily because users want both functionality and ease of use.

While it was never *called* a personal information manager, the most successful personal information manager to date was introduced in 1984: Borland's *SideKick*, which has a phone dialer, a calendar, and a notepad. The reason we used *SideKick* was not because of its specific features—how many people know that *SideKick* has an ASCII table to help programmers identify special characters? We used it because it worked "behind" other applications. Because *SideKick* was a terminate-and-stay-resident (TSR) program that ran in the background, it didn't force you to quit what you were doing in order to do something else—the perfect solution for keeping track of personal information.

That little feature—instant availability—is the key to software that we will actually use to manage personal information, and (*SideKick* aside) it's the one feature missing from every DOS-based personal information manager introduced to date. If you spend your time writing words or analyzing numbers or managing data, you can't afford to dedicate a computer to managing personal information. If you have to quit your program, start another, and then return to the first program, using a personal information manager isn't convenient enough to be worthwhile.

Enter *Windows*. I've thought for some time that the ultimate solution to creating a personal information manager is to make it graphical and have it run in an environment where it can sit in memory, awaiting your next move. *Windows*, being both graphical and multitasking, would seem the perfect such environment. Developers, never shy of obvious opportunities, have come up with three new *Windows*-based products: Okna Corporation's *DeskTop Set* (see the review in our November issue), Polaris Software's *Pack Rat*, and IBM Desktop Software's *Current*. Each combines elements of all the previous efforts to design information managers that run on DOS.

(continues)

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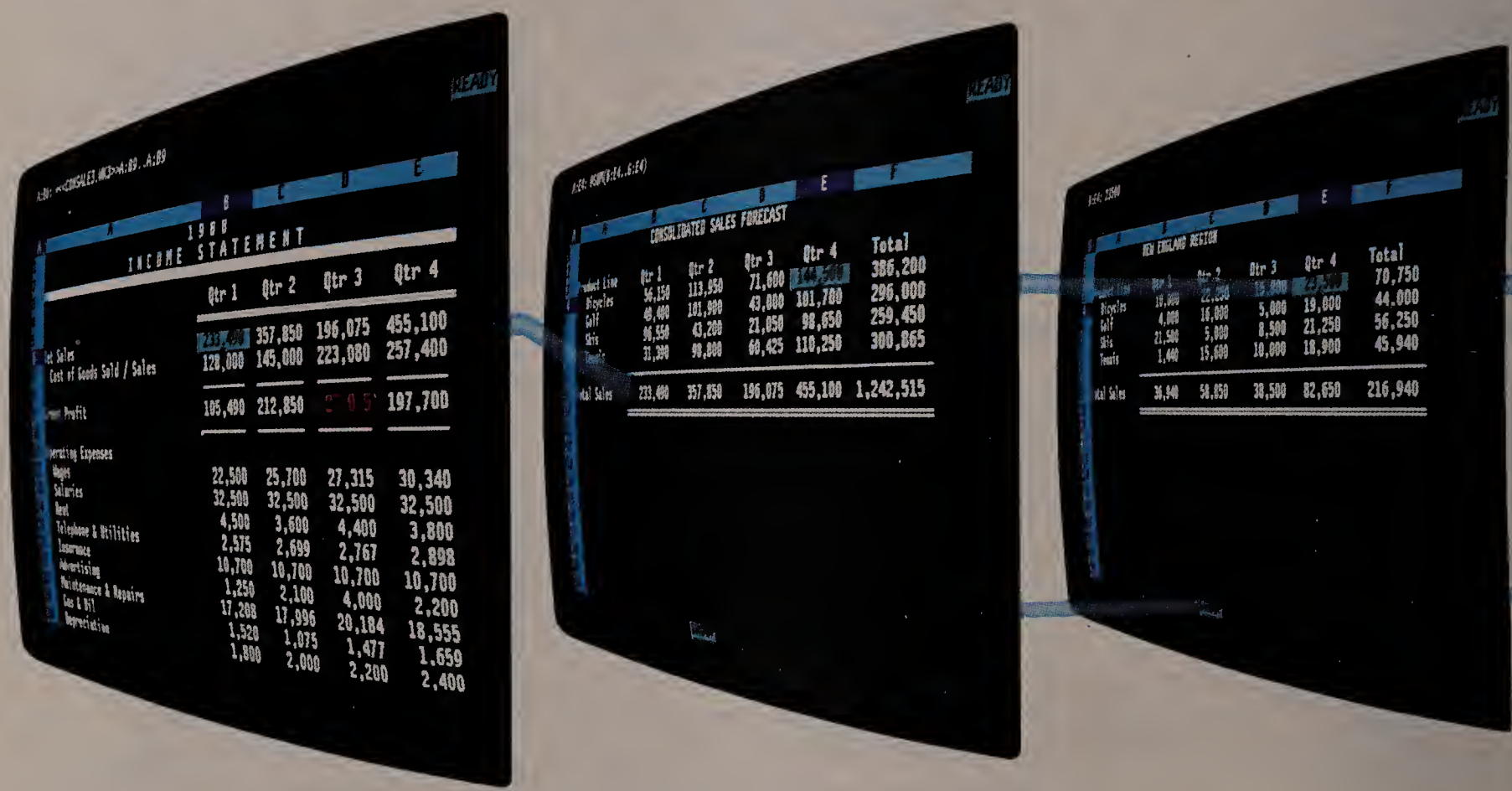

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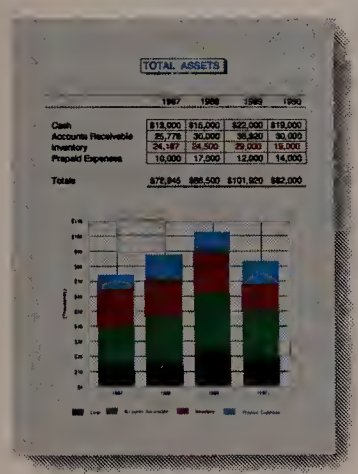
Release 3 is for DOS or OS/2® users. Its breakthrough spreadsheet design makes it ideal for managing highly complex tasks. For example, rolling up multiple departmental budgets, analyzing a database of company expenses or building a financial reporting system.



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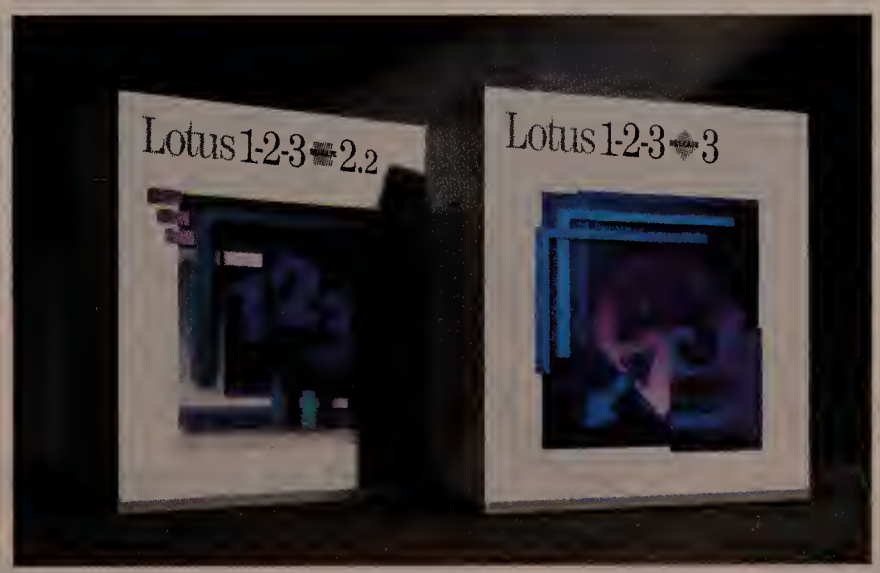

The New Lotus 1-2-3

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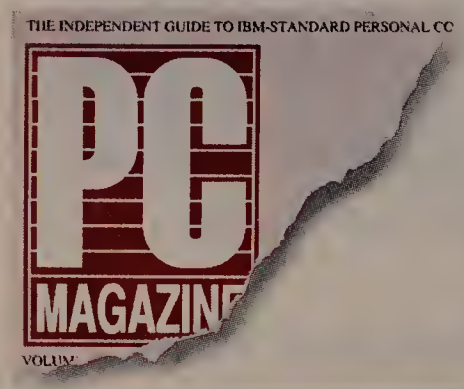
Release 3 runs under DOS or OS/2. Hard disk and 1 Mb system memory required in DOS, 3 Mb in OS/2. Lotus certified compatible PC AT with 80286/80386 processor required. Release 2.2 runs on Lotus certified PCs of all types in DOS with a minimum of 320K system memory.

DeskTop Set: Not Yet Ready for Prime Time

DeskTop Set is more *SideKick*-like than the others, since it actually acts as an extension of *Windows* itself. *DeskTop Set* provides a set of utilities—calculator, screen saver, phone book, phone dialer, and calendar—that appear as items in a Run menu on the DOS Executive's menu bar. You can also add other programs to the Run menu. But *DeskTop Set* is a personal information manager only to the extent that it provides specific utilities for managing information, such as the phone book, calendar, and phone dialer. And a more serious limitation is that the program seems to still be evolving. The difference between two versions I used was so substantial that the documentation for the first version was misleading when using the second. Equally disappointing, the configuration options are nearly unintelligible, and I encountered a bug that would dump me out of *Windows* and leave me at the DOS prompt. In other words, *DeskTop Set* is a great idea that suffers from its current implementation.

Pack Rat: Electronic List Maker

Polaris's *Pack Rat* gives the user a much more comprehensible set of tools for managing personal information. It can help keep track of people, expenses, appointments, tasks, phone calls, and files. The program's central metaphor is the list. All available information is displayed as a list, but similar items from different lists can be grouped in a "global list" according to assigned keywords. Of course, *Pack Rat* uses *Windows*' graphics to provide visual aids. But *Pack Rat* is more like Symantec's *GrandView:* You have to buy into the notion of using lists (or outlines in *GrandView*) to figure out how to use the program effectively. It's more difficult to figure out how the program works and how to apply it than with *Current* or *DeskTop Set*. And *Pack Rat* is somewhat less adaptable than *Current* because the fields of information for each list are predefined and don't seem to be modifiable.



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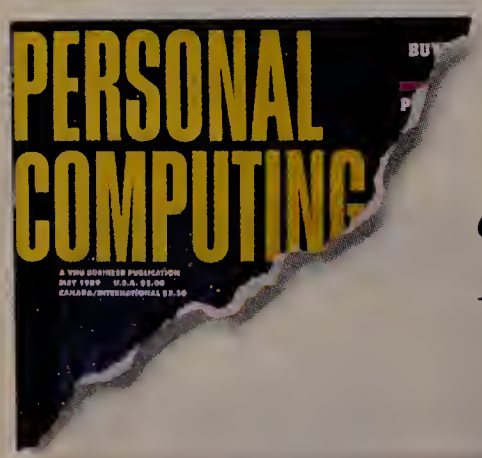

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Current: Build Your Own PIM

Current offers the same basic functionality as *Pack Rat* in terms of managing names, expenses, appointments, and so forth. But *Current* has a much looser concept and can be customized by the user to a much greater degree. *Current*'s approach involves Items, Views, Categories, and Connections (terms similar to those in Lotus's *Agenda*). Items are the equivalent of records in a data base and contain fields for specific pieces of information. Views are the equivalent of files in a data base and can be customized to show particular fields on screen. It's harder to find an equivalent for Categories; basically, they are similar types of Items that exist between Views. And Connections are like relations between tables in a relational data base. IBM (and the program's developer, Jensen-Jones) has created ten Views for you to get started with. As you work with the program, you can customize the prefabricated Views or make entirely new ones. *Current* is much harder to conceptualize than *Pack Rat*, since it lacks a central organizing metaphor (such as *Pack Rat*'s lists). But once you've figured out how to use the different pieces, *Current* is more flexible and extensible than *Pack Rat*.

What's fascinating about this first crop of *Windows*-based personal information managers is how closely they resemble the existing DOS-based programs: *DeskTop Set* is like *SideKick*, *Pack Rat* is like *GrandView*, and *Current* is like *Agenda*. But whereas DOS users who wanted instant availability were restricted to *SideKick*, *Windows* users can choose any one of three approaches without sacrificing that crucial feature. ●

Stewart Alsop is editor and publisher of P.C. Letter *and a contributing editor for* PC World.

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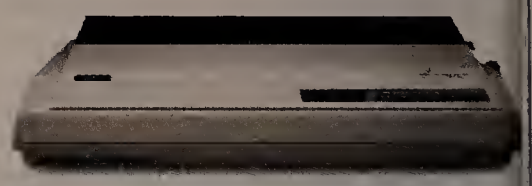

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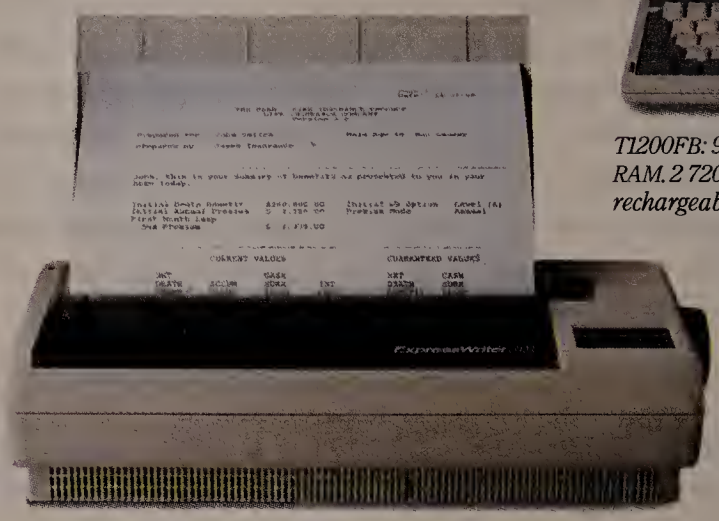

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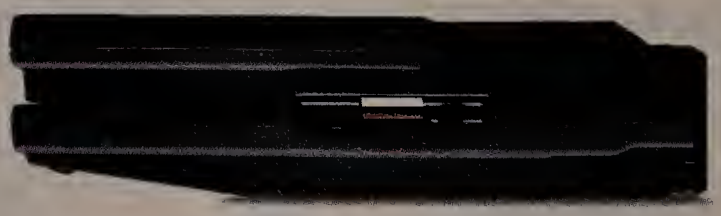

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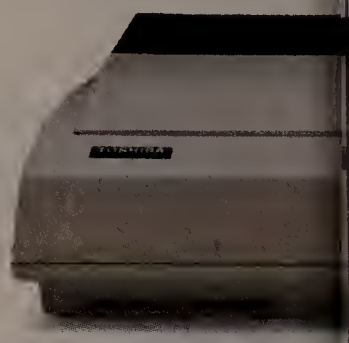

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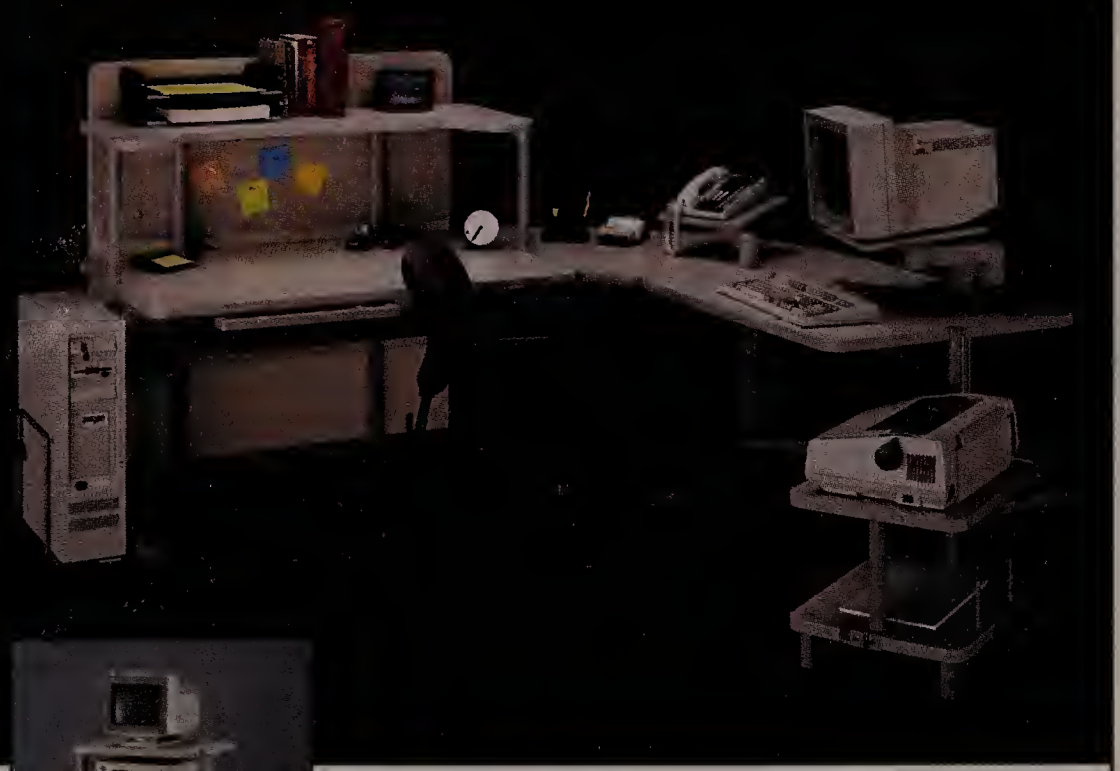

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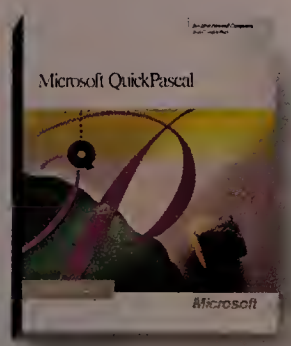

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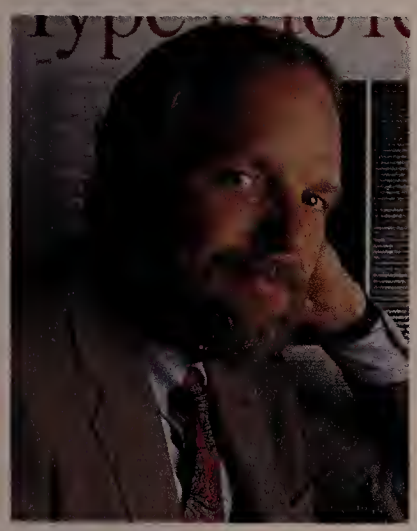
Edited by ERIC BENDER

IBM Still Examining Options

Microsoft/Apple Alliance Stuns Industry

Redefining "PostScript Compatible" for OS/2 Fonts



Adobe's John Warnock sees his publishing standard jeopardized by a startling collaboration between Microsoft's Bill Gates and Apple's John Sculley.

ROBERT HOLMGREN ED KASHI ROBERT HOLMGREN (LEFT TO RIGHT)

Nowhere in PC software does fantasy turn to frustration more quickly than with text fonts. Ideally, any application would let you choose instantly from an extensive library of fonts and then print out *exactly* what you see on the screen—with proper fonts and everything else, and without the need to wrestle with printer cartridges. The best (and perhaps only) hope for such a comprehensive solution comes from the Microsoft–IBM OS/2 Presentation Manager environment, and a high-stakes, behind-the-scenes battle has been waged over who provides the necessary technology. "This is one of the biggest decisions of the nineties," comments Cathy Lyons, product marketing manager for Hewlett-Packard's Boise printer division.

When Microsoft suddenly outlined the decision in September, it was a shocker: a joint agreement with Apple Computer that delivered a body blow to Adobe's PostScript. Under the agreement, Presentation Manager (PM) and upcoming Macintosh system software will share the same font scaling and printer/page-description technology. Apple will provide its Royal font technology and Microsoft the page-description software (based on a superset of PostScript).

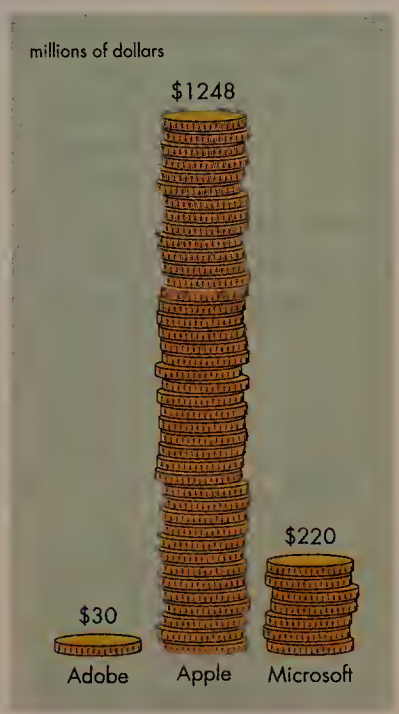
Third parties still can offer fonts (and perhaps even alternative font-rendering technology) for the new PM software. Font vendors like Bitstream and application suppliers like WordPerfect hailed the agreement.

The tiny ranks of PM users could start to profit as soon as a year from now. Not only will they enjoy a *single imaging model* in which the screen display precisely matches the printed output, but they'll be able to swap documents with their Mac peers without losing fonts. Tailored printers, from Apple and others, will support the new capabilities. (Some Royal favors may also be bestowed on *Windows*, although Microsoft did not make this point clear.)

Although Royal fonts represent the mainstream, printer giant Hewlett-Packard gets a consolation prize for its Compugraphic Intellifonts entry. Microsoft and HP will offer the option of a driver for PCL 5—the next version of the LaserJet language. So if your PM application supports that driver, "you'll be able to switch from Royal fonts to Intellifonts, not only on the printer but on the screen," comments Barry Tepper, analyst with CAP International in Norwood, Massachusetts. Although PCL doesn't aim for the same level of graphics power as PostScript and its peers, it may prove a popular midlevel alternative.

So why was the agreement a shocker? The first reason was the ongoing and entirely serious legal feud between Apple and Microsoft over copyright issues. Microsoft won the early rounds, but Apple claims it has no intention *(see Microsoft/Apple, p. 76)*

Adobe Fights Giants



When Apple and Microsoft disclosed the deal that targets Adobe's market, these were the firms' most recent quarterly sales.

System Prices Falling

Major Vendors Reposition Lines

High-Powered Desktops

The three largest suppliers' prices are in the same ballpark for desktop models with a 25-MHz 32-bit processor, 2MB of memory, and 60MB of hard disk storage (40MB for the Macintosh IIci).

Computer prices took a plunge this year, in part because memory chips grew much cheaper, but also as a result of a slowing market and an ever-increasing number of players.

As the holiday season approaches, the Big Three—IBM, Compaq, and Apple—have all either cut prices or instituted price promotions. Lower on the food chain, many clone makers seem almost willing to pay you to haul the things away. Len Farache, owner of C&A Warehouse Outlet in San Jose, California, reports that he is selling a 12-MHz, 286-based Packard Bell PB686 with a 20MB hard disk and monochrome monitor for $1188—about 50 percent less than last year's sticker for a similar system.

Of course, many of us don't know a deal when we see one because it's so hard to make sense of all the competing price/configuration alternatives—especially given suppliers' fondness for passing off 16-digit alphanumeric designations as computer names.

Try to figure out the differences between IBM's new PS/2 Model 70-A61 and the PS/2 Model 80-071. The answer, of course, is that the PS/2 Model 80-071 gives you four more add-on slots and an extra 10MB worth of hard drive for only another $100. Ah, but the 25-MHz PS/2 Model 70-A61 happens to be about 50 percent faster than the 16-MHz PS/2 Model 80-071. Maybe IBM figures that buyers of fast CPUs aren't interested in expansion and storage. Customers have had to choose between faster CPUs and more slots and storage since the Model 70 was first introduced.

Some might suggest that the Model 80 is an arrow-riddled pioneer that just hasn't fallen over yet. But James Cannavino, IBM's Personal Systems Group head, declares that sales of Model 80s are increasing. IBM did take a step toward simplifying its line in early fall by cutting prices on several of its systems, boosting memory on others, and filling in some gaps with a couple of new models (see *Top of the News* in this issue).

Compaq's line is much easier to figure out. Its prices step up in orderly increments in direct proportion to a model's CPU speed, standard memory, and disk storage.

Apple's Macintosh pricing generally reflects the incremental cost of processor, memory, and storage more directly than IBM's but less than Compaq's. It also shows that you pay more for proprietary technology—one case in point being the rather dear ($6500) Macintosh Portable. Apple blames the price of the fast (25-MHz), heavy (16-pound) laptop on its 6-to-12-hour battery and high-quality monochrome screen. But other manufacturers have long maintained that Apple has been able to enjoy margins unheard of in the IBM-compatibles market.

"Apple has to be the worst value in terms of size of screen, expansion capabilities, and speed of drives," insists C&A's Farache. He claims that the street prices of some Macintosh models are $2000 above those of the comparably equipped PCs that he sells. "It is ridiculously priced, and a lot of people are starting to realize that."

Macintosh defenders respond that you must factor in the cost of the bundled Macintosh graphics environment and software. Even without those, the $8499 list price of the new 25-MHz Macintosh IIci with 4MB of memory and an 80MB hard drive is very competitive with the $8395 list of the IBM PS/2 Model 70 386-A61 or the $8499 price of the Compaq Deskpro 386/25 Model 84. The Mac IIci provides 2MB more memory and 20MB more storage than the IBM, and 3MB more memory but three fewer slots than the Compaq.

Real differences can be seen only on the street, where literally hundreds of roughhouse clone vendors drag prices down. If you're willing to pass on the IBM and Compaq brand names, you can choose from a mind-numbing array of system options at a tidy savings. On the other hand, if you need a Macintosh, you'll have to buy from Apple.
—*Mike Hogan*

IBM Readjusts Pricing

System	CPU	Price
Model 50Z	10-MHz 80286	$3650
Model 55 SX	16-MHz 80386SX	$4295
Model 70 386-061	20-MHz 80386	$5795
Model 70 386-A61	25-MHz 80386	$8395

This fall IBM smoothed out pricing among its desktops—although there's still a big jump to the top of the line. These are configurations with 60MB drives and 2MB of memory. (The Model 50Z is an exception, with 1MB of memory—upgrading to 2MB costs a hefty $1030.)

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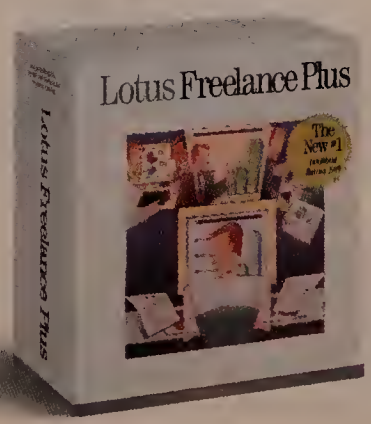

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Busing Debate Simmers

IBM Upgrades MCA; EISA PCs Debut

PS/2 nets will gain flexibility when MCA "busmaster" boards act as net servers, says IBM's Robert Carberry.

RENEE LYNN

Long running and relentlessly technical, the argument about competing PC data pathway designs flared up again this fall, as IBM revealed new capabilities in the PS/2's Micro Channel Architecture (MCA) a few weeks before the debut of the first Extended Industry Standard Architecture (EISA) machines.

Robert Carberry, vice president for systems at IBM's Entry Systems Division, disclosed that existing PS/2 buses can zip data around at up to 160MB per second without modification. "We're changing the protocols on what is basically the existing wire," he says.

Of course, no component in today's PS/2s can approach 20MB per second, IBM's previous claim for maximum throughput, which already represents massive overkill for almost all jobs.

But Carberry insists that the added throughput will offer real benefits in the not-too-distant future, because the MCA bus will begin to act as an internal local area network that links with other PS/2s on a conventional net. Customers can sprinkle intelligent "busmaster" cards on various PS/2s on the net, and the busmasters can act as servers for storage, communications, and other applications, he says. He acknowledges that this is hardly the traditional scheme of specialized and centralized net servers, but he says it increases flexibility and availability.

His vision is not yet upon us; among the obstacles, only a few dozen busmaster products have been unveiled. But MCA itself has enlisted solid backing, including over 1000 available boards. And a few major vendors (including Tandy, ALR, NCR, and Wang) now offer clones, although none has hit notable volumes.

EISA proponents, beginning to deliver actual products, shrug off IBM's disclosures. "I don't see anything major in the announcement; it looks like they're trying to correct some of their system design problems," says Gary Stimac, vice president for systems engineering at Compaq, the first among EISA equals. "IBM's trying to get into the bus wars again, when we're about to demonstrate application solutions."

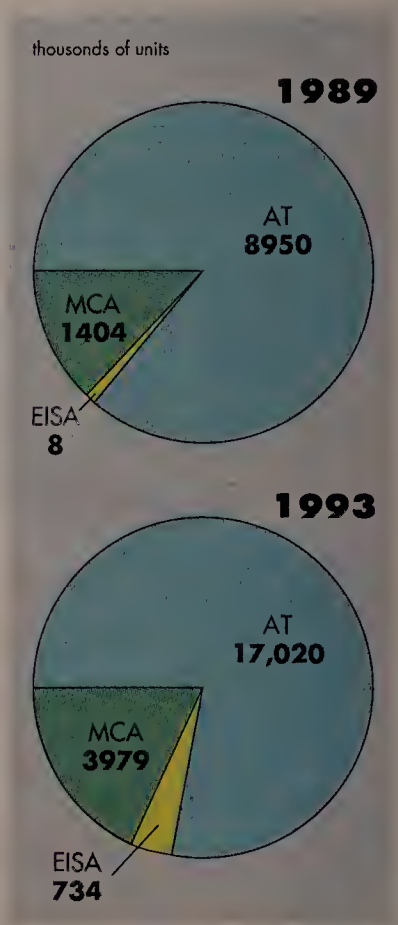
Stimac downplays the need for such high levels of throughput. EISA could be upgraded past its current 33MB-per-second limit, but that rate "is extremely adequate," he says, pointing out that even disk drives typically transfer a maximum of only 1MB or 2MB per second. And while EISA busmasters could handle the kind of net setups Carberry describes, Compaq's preference is for highly specialized servers. (Outsiders expect its first EISA product to take the 800-pound-gorilla approach to net servers.)

Other advocates emphasize EISA's nonproprietary nature rather than the esoterica of bus design. "I spend a lot of time with customers, and I haven't had one of them lay out a requirement that said MCA or EISA," remarks Robert Kavner, AT&T group executive for computers.

The controversy rests on market rather than technical issues, and most users aren't affected, says Robert Charlton, an industry analyst at Dataquest. EISA aims primarily at servers and high-powered PC workstations, he notes. MCA has a broader focus, but he expects AT-bus machines to dominate the market for years to come.

Regardless of the debate, both IBM and Compaq are showing healthy sales growth. IBM says revenues through U.S. dealers rose 30 percent in first-half 1989 over the previous year; Compaq's worldwide sales climbed by 57 percent. In terms of 80386-based machines that represent the leading edge of the market, "Compaq and IBM are neck and neck," reports JoeAnn Stahel, vice president at StoreBoard.
—*E. B.*

AT Standard Still Drives Bus Choices



The AT bus will remain the strongest standard far years to came, predicts Dataquest. PCs incorporating IBM's Micra Channel architecture are claiming a sizable chunk of the market; the high-end Extended Industry Standard Architecture machines will sell only in small valume even by 1993.

NINE REASONS TO BUY CLIPPER WITHOUT A MOMENT'S HESITATION!

The Clipper language offers two compelling reasons to adopt it as your application development standard: open architecture and .EXE file generation. Clipper 5.0 boasts even more. We think you'll be convinced before you reach number nine.

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Clipper is both powerful and easy to use, with the most comprehensive command and function set available. Want more? Extend the Clipper language with user-defined functions written in Clipper, Assembler, C and other languages.

2 User-defined Commands.

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Clipper's compiler yields stand-alone .EXE files for unrestricted distribution, requiring no LAN-PACKs™, no run-time modules and no licenses of any kind!

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Clipper

5.0

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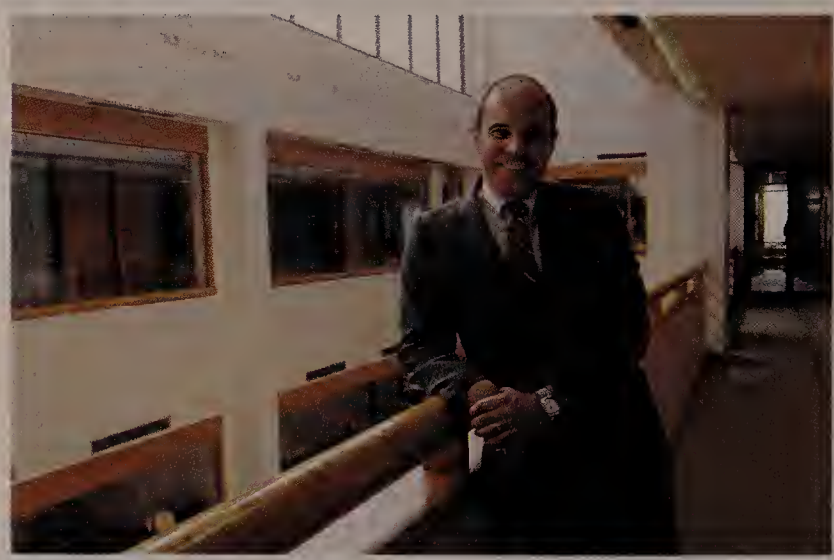
Circle 193 on reader service card

IBM Recasts Applications

Can It Avoid Hardware Mind-Set?



The Desktop Software Group is "breaking the mold" for IBM's PC application business, says Fernand Sarrat.

IBM sells $7 billion in software each year but enjoys precious little success in PC applications. The problem is that the computer heavyweight historically pushed software "with an eye to helping the hardware sales," acknowledges Fernand Sarrat, general manager of IBM's Desktop Software Group. But in his group, formed earlier this year, IBM has finally assembled an independent development force, marketing and sales staffs, and an advertising budget.

The Milford, Connecticut, organization will nurse along the few IBM packages that sell in bulk —particularly *DisplayWrite*, although most non-IBMers see the word processor's underlying design as obsolete. IBM will still write some packages in-house (although several, like the existing accounting line, have been killed). But the group puts greater effort into alliances with outside developers, and it hopes to ink high-profile deals this fall. In the first, IBM will market *Platinum* accounting software, developed by Advanced Business Systems.

An earlier agreement with startup Jensen-Jones should bear fruit this fall in *Current*, a *Windows*-based personal information manager. A venture with Publishing Solutions, another small shop, is expected to produce a presentation-graphics package with multimedia support next year.

IBM offers developers more than its name and its deep pockets. For the Publishing Solutions package, "we were not the highest bidder," Sarrat says. "What we bring to the table is a focused and dedicated sales force, dollars, and access to channels and large accounts."

While IBM has no plans to offer a spreadsheet, "the rest of the major categories look attractive," Sarrat says. "We're very interested in going into data base and accounting. That's the first wave. The next has to do with multimedia, searching text-based information, and *OfficeVision*."

Desktop Software is set up within IBM's massive Applications Software Division, but the division's head views himself "as our investment banker," Sarrat says. Sarrat has hired both within and without IBM, "breaking the mold of how we build an organization like this," he says. Previously, he points out, "our methods of attacking the market have been very oriented to the way we do business in hardware—which is very successful, but doesn't necessarily translate into building high volumes of PC software."

Outsiders describe the IBM heritage more bluntly: "The guy's walking around with a boat anchor around his neck," says Jeffrey Tarter, publisher of *Soft-letter* in Cambridge, Massachusetts. Additionally, he says, the IBM group "lacks focus. It needs a core technology and a dedication to an [application] market, and it doesn't have them.
—*E. B.*

Microsoft/ Apple

(continued from p. 71)

of dropping the suit.

Second, Microsoft lacked an enthusiastic blessing from IBM, so the move represents the partners' first public division on standard PM. Technically, the Apple technology is "a very good piece of work," says James Cannavino, head of IBM's Personal Systems Group, "but we have not concluded what we will do." However grudgingly, IBM will support the Royal offering. But it has made a substantial commitment to Adobe's PostScript technology (particularly for UNIX workstations) and prefers not to license critical software from Apple.

Adobe clearly will suffer from the Microsoft/Apple blitzkrieg. In the extraordinary public session where Microsoft chairman Bill Gates disclosed the licensing deal, Adobe chairman John Warnock made an emotional appeal to preserve "our standard." More important, he finally bowed to outside suggestions that Adobe release the specifications for its font-scaling software.

"Adobe still has a lot of clout in the marketplace," says CAP's Tepper. The firm has dozens of significant licensees, and Microsoft and Apple won't immediately offer product alternatives. It also remains unchallenged in typesetting and in the UNIX market. But as Microsoft and Apple begin offering product, Adobe will no longer set the desktop page-description standard.

"PostScript lives," sums up Bitstream president Rob Friedman, "but it may become the PostScript controlled by Apple and Microsoft." —*E. B.*

BARRY TENIN

TWO-FISTED MANAGEMENT
©1989 M C MAREK, 33
'TWAS THE NIGHT BEFORE CHRISTMAS...
JINGLE JANGLE
CLOP CLOP
IT'S HIM!!
Ah, Mr. Claus! Glad to see you could keep your appointment. Have a seat.
HO HO HO
Now, here is the requisition sheet I faxed to you some months back. I believe it's reasonable; delivery by the 25th, of course.
HO HO HO
HO, HO! I was expecting this. Fortunately, I've had my elves put together a counterproposal.
Just one minute. I don't see the Reed buyout! And where's my new R&D department? Chemco has a new R&D department and I want one too. I've been a good CEO all year!
HO, HO, HO! Listen, Harris, I'm understaffed and 15 months behind production schedule. And with this glasnost thing, I've got routes popping up all over Eastern Europe.
Tell you what I'll do. If you'll forget the telecommunications center and the new database system and the private satellite, well, then...
...I'll see what I can do about the train set.

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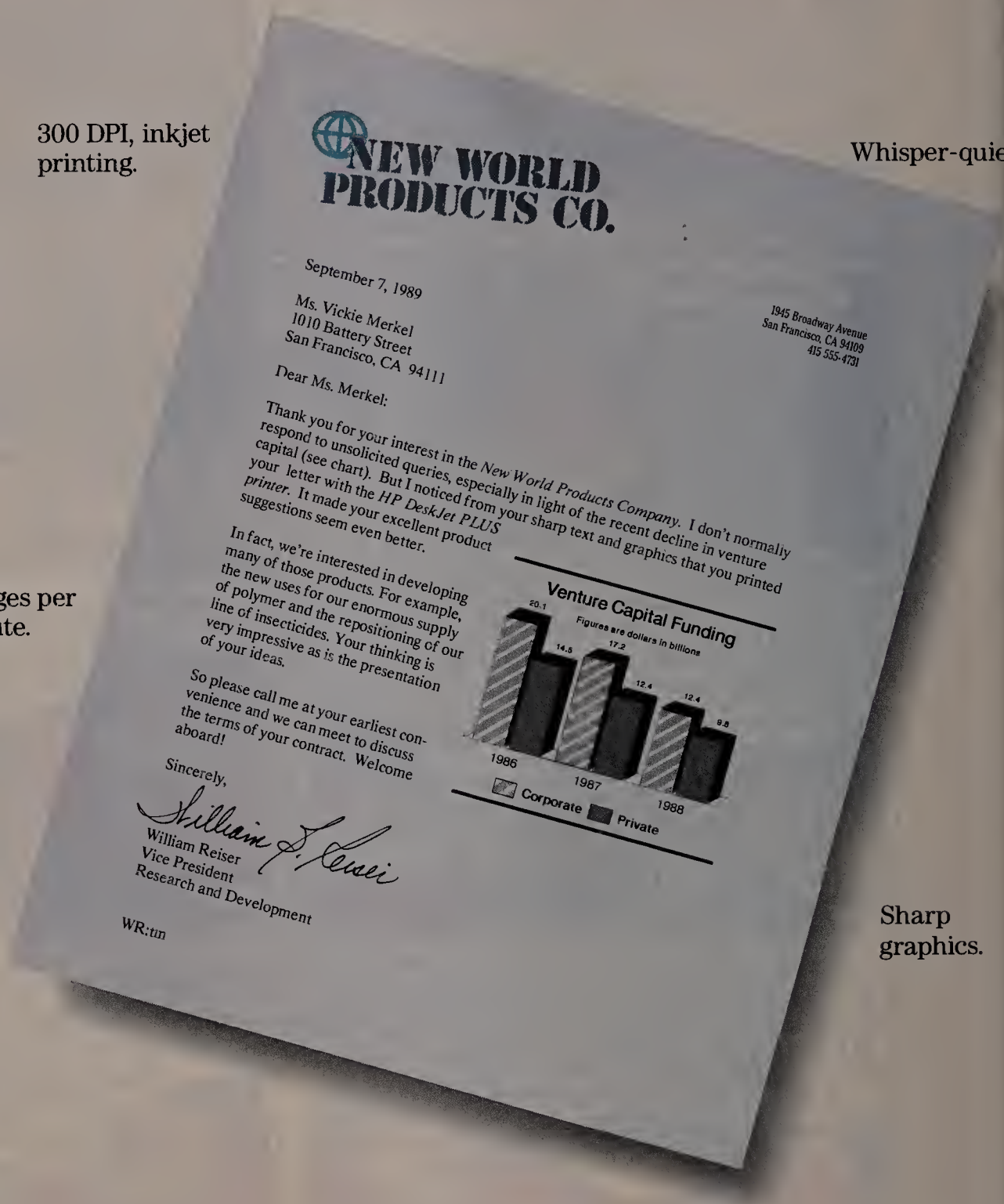

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September 7, 1989

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San Francisco, CA 94111

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US vs. the dot matrix printer.

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There is a better way.

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Circle 104 on reader service card

Compaq Lightens Up

Two breakthrough laptops pack desktop power into a battery-powered, notebook-size package. Even the price tag has been downsized.

Eric Knorr

PIERRE-YVES GOAVEC

They said it couldn't be done: a hard disk, a 3½-inch floppy drive, a backlit screen, and 3½ hours of battery life in a notebook-size box.

PC World offers first impressions of prerelease hardware and software

It's a disease of our time. We work everywhere: at home, on airplanes, in hotel rooms, on the way to work. The next best thing to leisure time would be a go-anywhere laptop powerful enough to help finish the job fast but small enough to fit—*really* fit—in a briefcase.

Enter the first members of a new class of laptops: the Compaq LTE and LTE/286. Like the NEC UltraLite and the Zenith MinisPort, these gadabout productivity tools are about the size of a notebook. But unlike their rivals, the LTE systems deliver functionality usually associated with laptops of twice the size and weight.

Compatible, capacious mass storage makes the LTE series a genuine breakthrough. Forget about the UltraLite's credit-card–ROM applications and the MinisPort's 2-inch floppy drive. Each of Compaq's 6.2-pound, 1.9-inch-tall units sports a 3½-inch floppy drive—and a 1.44MB one at that. Even better, you can buy 20MB or 40MB hard disk models that weigh only 4 ounces more. A nickel-cadmium battery keeps either the LTE or the LTE/286 running for at least 3½ hours.

PC World previews are informal assessments of products that at press time were still in the development stage. Complete reviews—including features evaluations and performance testing—will appear only after a product is officially released.

Everyman's Laptop —From Compaq?

Now for the really good news. Although it's from a company renowned for blue chip pricing, the LTE/286 Model 40 sells for shockingly little. With a 12-MHz 80C286 CPU, 640K (expandable to 2.6MB), a socket for a 12-MHz 80C287, a 29ms 40MB hard disk, one floppy drive, an AC adapter/charger, and a slipcase, the unit costs $4899—less than many similarly equipped (but much larger) laptops. With a 29ms 20MB drive, the LTE/286 Model 20 comes in at $4399; the floppy-only LTE/286 Model 1 holds the line at $3799.

Where, you might ask, does this leave Compaq's other laptop, the SLT/286? Choose the LTE/286, and you'll miss the SLT/286's stunning VGA display, optional docking station, and capacity for an extra megabyte of memory. But the two offer identical drive options and processing power, even though the LTE/286 slips in at less than half the size and weight—and costs $1100 less for an equivalent 40MB configuration.

Compare the lowball LTE Model 1 with the $1999 MinisPort (which is considerably less than the UltraLite), and things still look rosy. For $200 and about a pound more than the MinisPort, you get an extra hour of battery life and a 9.54-MHz 80C86 rather than an 8-MHz 80C88—plus an industry-standard 1.44MB drive that makes software and data transfer a pleasure instead of a pain. The LTE's sole hard disk model (the 20MB Model 20) sells for $2799; MinisPort users can only dream about a hard disk.

Instead of a docking station, the LTE line offers a $299 external storage module that holds a half-height 5¼-inch floppy drive or a 40MB tape backup unit. Compaq offers no expansion chassis for standard 8- or 16-bit boards. However, behind a pop-open door the LTE has two proprietary interfaces—one for either a 2400-bps modem ($429) or a serial port board ($149), the other for memory.

The LTE/286's 1MB memory board costs $699, while the 2MB board goes for $1299. The LTE is expandable only to 1MB, and getting there costs $349. Other accessories include a plug-in numeric keypad ($199), an extra-large case ($89), and a Fast Charger/AC Adapter ($199) that fully replenishes the battery in an hour and a half.

A Little Monster

The most impressive ingredient of the LTE line is the drive technology. The floppy and hard drives stand a mere ¾ inch tall—roughly ⅜ inch shorter than standard third-height devices. Compaq claims the drives are so durable you'd have to shatter the machine before you crashed the disk. And with a 29ms average access time, a 1:1 interleave, and disk caching, the hard disks should perform at a desktop clip.

The printed circuit boards illustrate another advance. The heart of the machine consists of two 2-by-5-inch boards: the motherboard, and the I/O controller (which, along with controlling the drives, holds the CGA, one parallel and one serial port, and the external storage port). The traces on these boards are 5/1000 inch thick and are separated by as little space, for unsurpassed component density.

SNAPSHOT

Compaq LTE

For the first time, a laptop delivers a 3½-inch floppy drive plus an optional 20MB hard disk in a notebook-size package.

KEY FEATURES

- **1.44MB 3½-inch floppy drive**
- **20MB 29ms hard drive option**
- **9.54-MHz 80C86 processor**
- **640K RAM expandable to 1MB**
- **Backlit CGA LCD**

AVAILABILITY

Immediate

PRICING

$2199, with 20MB hard disk
$2799

Compaq Computer Corp.
20555 FM 149
Houston, TX 77070
713/370-0670

Reader service no. 731

SNAPSHOT

Compaq LTE/286

In the same 8.5-by-11-by-1.9-inch shell as the LTE, the LTE/286 offers a 12-MHz 80C286 plus 20MB and 40MB hard disk options.

KEY FEATURES

- **1.44MB 3½-inch floppy drive**
- **20MB and 40MB 29ms hard drive options**
- **640K RAM expandable to 2.6MB**
- **Backlit CGA LCD**

AVAILABILITY

Immediate

PRICING

$3799, with 20MB hard disk
$4399, with 40MB hard disk
$4899

Compaq Computer Corp.

Reader service no. 732

Shorter paths on the circuit boards and custom-made chips also help reduce power consumption. In addition, Compaq engineered the drives for low voltage and enhanced the battery for long life. Moreover, a utility lets you set individual time intervals for shutting down the hard drive, the backlight, and the entire system (except for the motherboard).

Even uncompromising systems like the LTE and LTE/286, however, make trade-offs between power and compactness. For example, with its rather bulky long-life battery and a hard disk, Compaq's units weigh about the same as a much larger, single-floppy Toshiba T1000—not heavy, but enough to wear on your knees after awhile.

To keep costs down, Compaq rejected the VGA, leaving LTE users with jaggy CGA resolution (an external port lets you hook up a CGA monitor). However, the blue-on-white image is quite pleasant, brightness and contrast controls are fully adjustable, and a utility lets you easily reassign colors to one of four shades of gray.

With an 8.5-by-11-inch footprint, you can't avoid shrinking the keyboard. A special-function key makes the 80-key arrangement 101-key compatible, but Compaq's layout leaves something to be desired. The cursor keys are in an awkward L formation rather than the usual inverted T, there's no lock for the special-function key, and the top and bottom rows of keys are undersized. The MinisPort's keyboard makes more effective use of the same amount of space and has a better feel.

Quibbles like these aside, the LTEs seem certain to sell like snow chains in ski season. The lack of docking-station expansion effectively rules out the systems as primary machines, but the dynamite combination of power, notebook proportions, and media compatibility—plus a reasonable price—should make Compaq's latest entries irresistible. ●

Eric Knorr is a senior editor for PC World.

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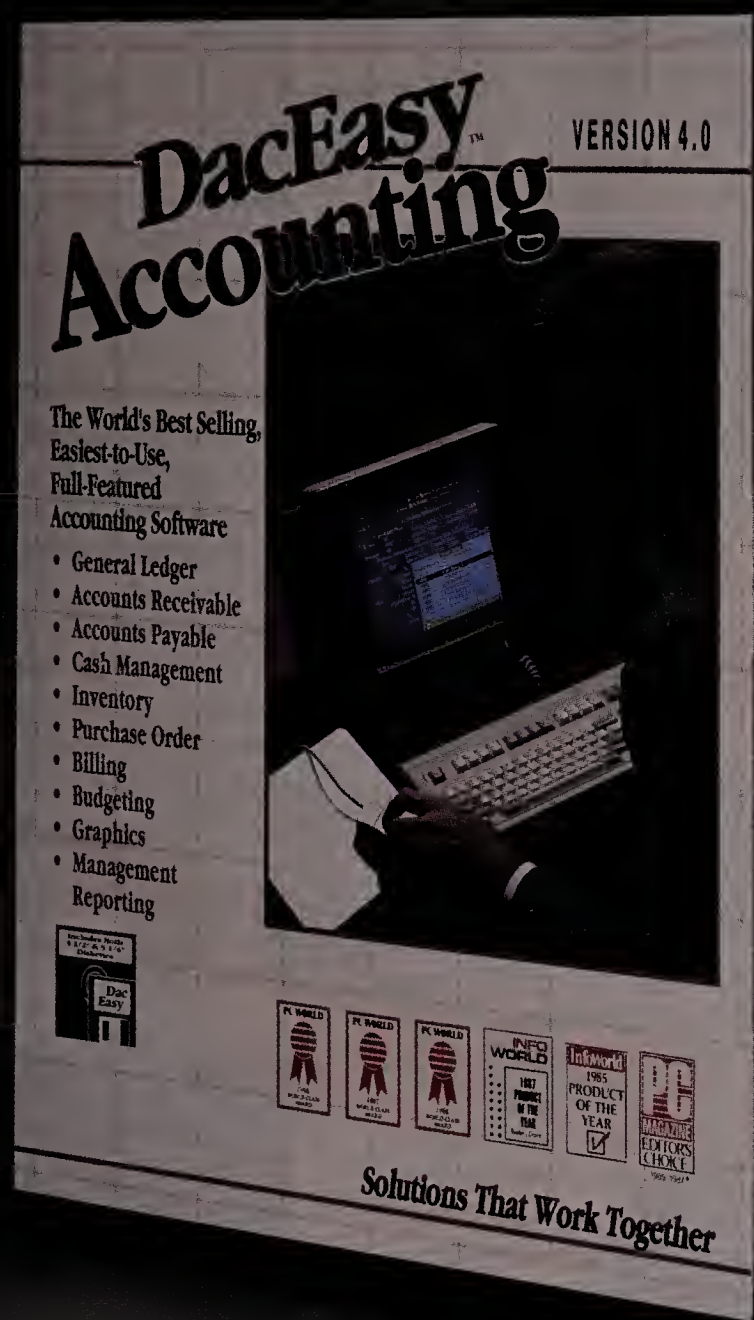

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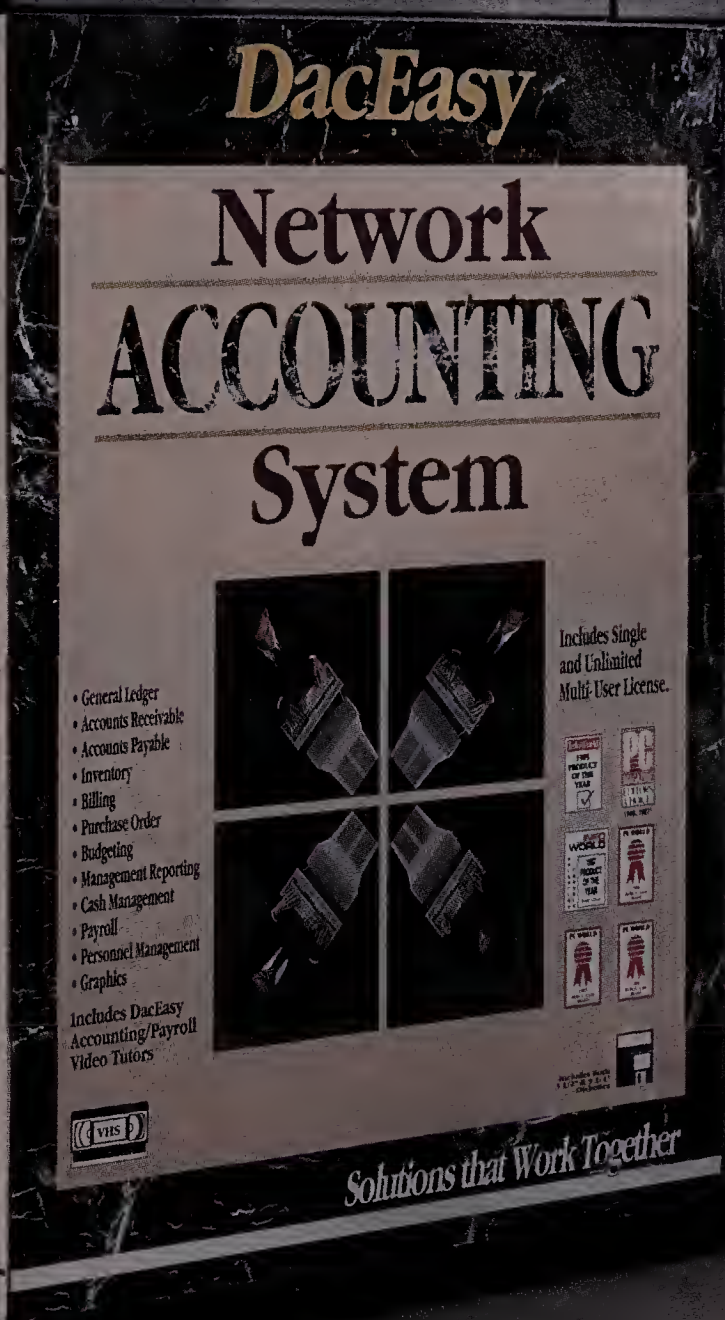

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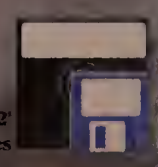

Includes Both 3 1/2" & 5 1/4" Diskettes

ILCO

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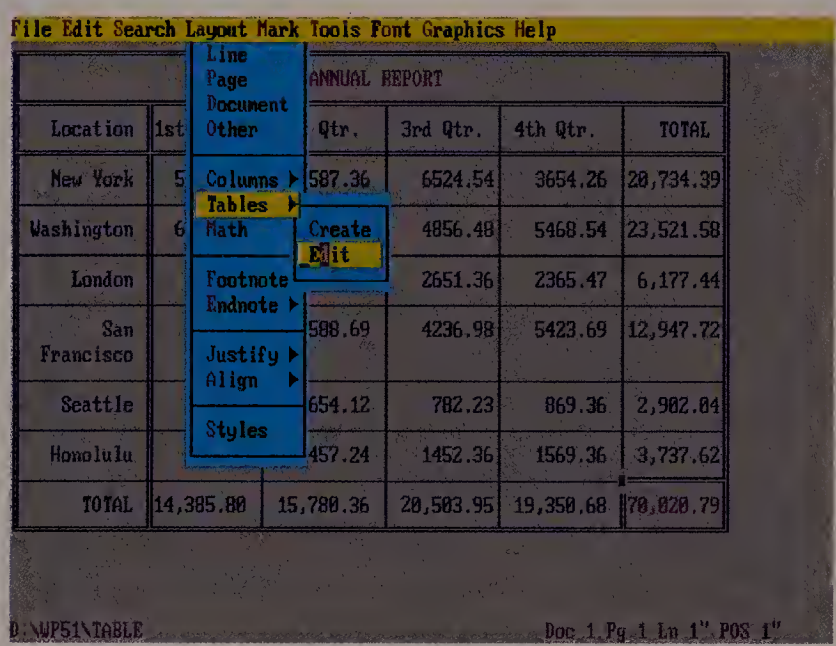
WordPerfect's Big Little Upgrade

Version 5.1 is hardly a modest revision—the latest WordPerfect adds pulldown menus, mouse support, and much more.

Lincoln Spector



With version 5.1, WordPerfect adds easy-to-use pulldown menus and flexible tables.

WordPerfect owes its popularity to many fine qualities, but ease of learning isn't one of them. Eventually, the folks in Orem must have wondered how much more successful they would be with an alternative to their nonstandard, function key–based interface. With version 5.1, due in early 1990, they, and we, have a chance to find out.

In addition to such features as tables and links to *1-2-3*, *WordPerfect 5.1* adds an alternative interface, with industry-standard pulldown menus, mouse support, and context-sensitive help. But traditionalists need not worry; the original interface is still there—in fact, the new menu bar remains hidden until you pop it up with a hot key.

Unfortunately, the program fails to take full advantage of the mouse. To mark blocks with it, you must drag the pointer from one end of a block to the other. Unlike *Microsoft Word*, *WordPerfect* offers no way to quickly grab a sentence or paragraph with the mouse.

Aside from the interface, version 5.1's most exciting enhancement is the table editor, which lets you easily create spreadsheetlike tables. You can stretch or shrink columns and rows via cursor keys (but not with the mouse). Cells and groups of cells can be joined, split, and given their own borders. Text wraps inside cells, with row height adjusting accordingly.

You can import spreadsheet ranges from *1-2-3* (*2.2* or a previous release) or *PlanPerfect*, either into tables or as tab-separated text. A worksheet can be linked to a *WordPerfect* file for easy updates.

The many special character sets, including math symbols and non-Latin alphabets, are now printed as graphics when not available in your printer's fonts. The new equation editor, which lets you format and print complex math statements, also prints graphically. In the beta version, the quality of these bit-mapped characters ranged from fair to unacceptable.

Mail merge is now controlled with a language much like *WordPerfect*'s macro language, complete with commands for conditional merges. You can merge data from delimited ASCII or *WordPerfect*'s own data format files. The formatting of labels has been automated. Also new are more-flexible tabs, dictionary-based hyphenation, and the suppression of blank lines at the top of pages.

A few major weaknesses have not been addressed. You can still open only two documents at a time, and the outliner, though improved, is not yet practical. Nevertheless, version 5.1 is far more than an incremental upgrade—it offers valuable improvements for new and experienced *WordPerfect* users. ●

Lincoln Spector is an assistant editor for PC World.

SNAPSHOT

WordPerfect 5.1

The market-leading word processor gains a friendlier interface.

KEY FEATURES
- **Pulldown menus**
- **Mouse support**
- **Table editor**
- **Merge language**

AVAILABILITY
Early 1990

PRICING
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Orem, UT 84057
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Reader service no. 720

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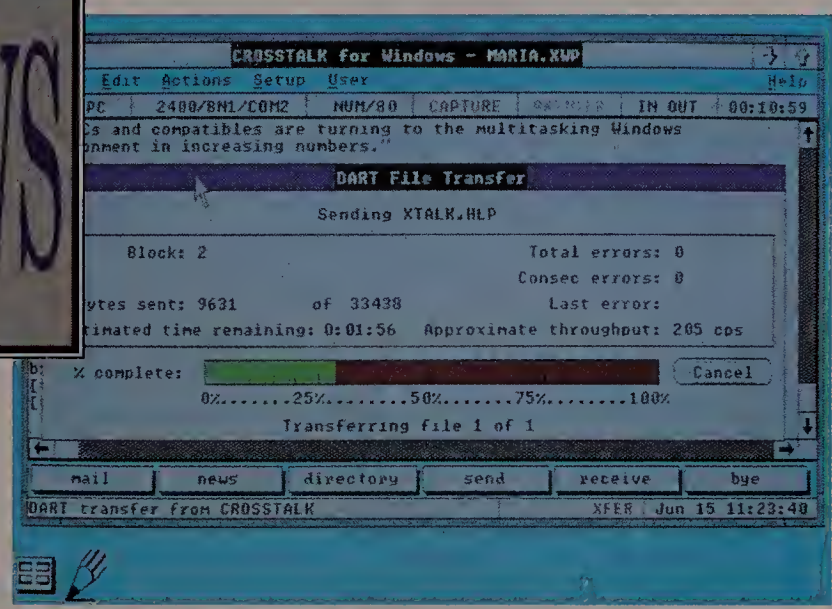

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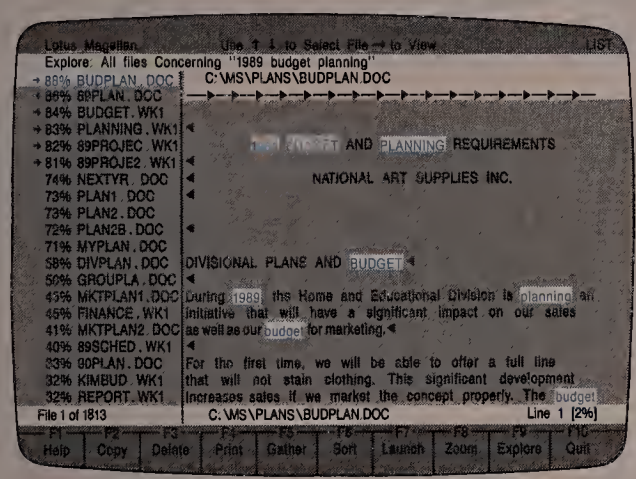
Because unlike other programs, the lagellan Explore function can perform a earch on a phrase, a topic, an idea or even an ntire file. Not just key words.

Then it lists your "found" files on the eft of your screen in order of how relevant he contents re to the earch topic.

As fast s you can croll down his list, the Magellan SpeedView unction in- tantly displays he complete contents of each file on the ight of your screen, highlighting the relevant ext for you.

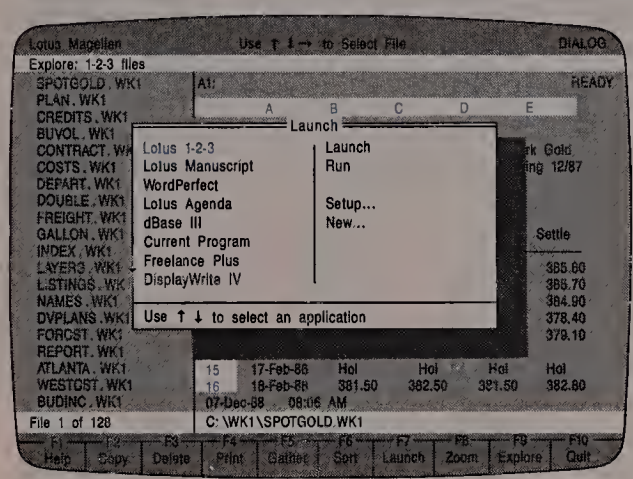


The Magellan Explore and SpeedView functions let you locate everything related to a particular topic and see it as it would appear in its native application.

Using the information is easiest of all. Because all it takes is one keystroke to launch nto the application that created the file, and t'll be loaded and ready to go.

Or you could use Magellan to gather the information you choose from several different applications (like a 1-2-3® spreadsheet and a WordPerfect® memo)[1] and put it into a single file so you can start using it right away.

Best of all, you're productive literally five minutes after installing Magellan. The menus are intuitive, and everything you need to run the program is on the screen right in front of you. Which means that there is virtually no learning curve.



With one keystroke, Magellan loads the selected file and application, in this case 1-2-3, so you're ready to go to work.

Call 1-800-345-1043 for your free Magellan demo kit. Ask for APV-3593 to learn more on why Magellan is the quickest, easiest way to access all the information on your hard disk.

That way, you can spend time working with information, instead of just looking for it on your PC.

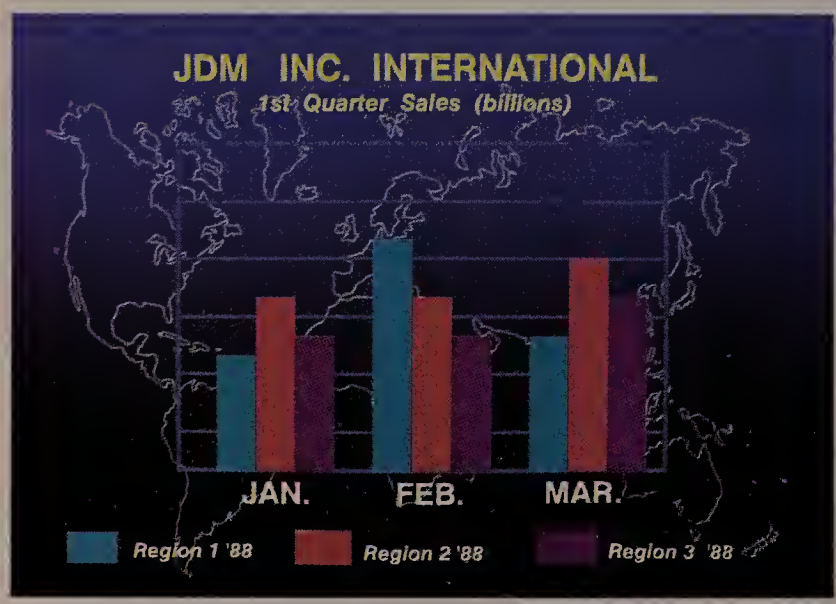
Introducing Lotus Magellan

nternational. dBase and MultiMate are registered trademarks of Ashton-Tate Corporation. WordStar is a registered trademark of Micropro International Corporation. Microsoft is a registered trademark of Microsoft Corporation.

Graphics for Word Crunchers

DrawPerfect offers eye-catching presentation features and hooks to America's favorite word processor.

Eric Knorr



DrawPerfect lets you create charts from scratch, add graphics, then send the results to a third-party slide service.

For most users, nothing pleases like a familiar interface. That's why WordPerfect has given *DrawPerfect*, its budding business graphics package, the familiar *WordPerfect* look and feel.

In addition to its snazzy presentation features, *DrawPerfect* offers smooth text handling, prolific file-format and device support, and a library of 500 editable symbols. The program also runs complete desktop slide shows in up to 256 colors. What you won't get in its 384K of code are analytical charting functions or the ability to show charting and drawing modules on screen simultaneously.

WordPerfect 5.0 users will feel right at home in *DrawPerfect*, with its similar text-based (as well as pulldown) menus, function keys, and compatible macro language. Importing *DrawPerfect* graphics into *5.0* documents promises to be a breeze. And *DP*'s *WordPerfect*-like text editor features word wrap, centering, underlining, italics, and more than 20 scalable fonts—leagues beyond most presentation packages.

The macro language is especially useful for creating templates, letting you record both keystrokes and drawing movements. You can create a chart, enhance it with a drawing, then regenerate the chart with new data, re-creating your hard-earned flourishes with the push of a button. Macros can be chained or nested and can call subroutines, pause for input, and even ring a bell.

DrawPerfect will support more than 250 printers and plotters (including PostScript printers) and 25 display modes—including enhanced VGA and true 256-color output for the IBM 8514/A. It also works with several third-party slide services.

The charting module, which resembles the *PlanPerfect* spreadsheet, lets you import .WKS, .WK1, *Excel*, and *PlanPerfect* files—plus named ranges from a *1-2-3* file. But the choice of charts is less than exotic, and the program lacks the curve fitting, regression analysis, and trigonometric functions offered by analytical packages such as *Microsoft Chart*.

Like Lotus's *Freelance Plus*, *DrawPerfect*'s drawing module packs a full selection of arrows, polygons, and curves (including Bezier curves). You can stretch, flip, and rotate objects and instantly convert freehand lines to vectors. The module will import 14 types of graphics files, notably in .PIC, .PCX, .CGM, EPS, and TIFF formats. Export formats will include .CGM, HPGL, and .WPG.

The program's slide show overlays let you reveal titles, bulleted items, and other objects one by one on top of a background image. However, you don't get the rich selection of transitions offered by such packages as *Graph Plus* and *Xerox Presents*.

DrawPerfect is another important building block in the *WordPerfect* environment. Though its charting features could be beefier, its text, drawing, color, and slide show capabilities stand with the best. *WordPerfect 5.0* users hungry for graphics should be especially happy. ●

Eric Knorr is a senior editor for PC World.

SNAPSHOT

DrawPerfect 1.0

A well-integrated graphics package joins the *WordPerfect* environment.

KEY FEATURES

- **Easy text handling with scalable fonts**
- **Rich drawing features**
- **Extensive file import/export**
- **Supports nearly 250 printers and plotters**

AVAILABILITY

First quarter 1990

PRICING

$495

WordPerfect Corp.
1555 N. Technology Way
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801/222-5000

Reader service no. 730

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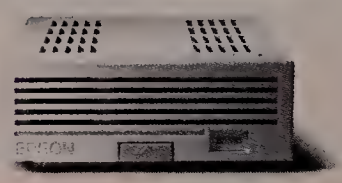

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PRODUCT OUTLOOK

INSIDE PRODUCT OUTLOOK

93 **Pan Overseas Echo 386**
An impressive list of standard features sets this trio of Echo 386 systems apart.

93 **Dauphin LapPro 386SX**
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96 **MultiSync 4d and 5d Monitors, MultiSync Graphics Engine**
Fine lines, big screen: MultiSync delivers what you need to run graphics-intensive applications.

96 **Mitac MPC2000SL**
For $999 you get a 286 with a compact footprint and room for expansion—a home/office bargain.

100 **Citizen GSX-140**
Plenty of options at a low price could persuade you to upgrade to a 24-pin dot matrix printer.

100 **Computerized Classic Bookkeeping**
A one-write bookkeeping scheme plus *Excel* spreadsheets yields powerful, easy-to-use accounting.

108 **GridLite XL**
Choose either a hard disk or a floppy drive for reliable storage on this 9.5-pound laptop.

108 **XPort**
Convert alien image files to the format of your current application with Micrografx's utility.

110 **GammaScript**
Get PostScript output from your fax machine with GammaLink's utility.

110 **Epson EPL-6000**
Here comes Epson's entry in the laser derby—a little bit slower than the LaserJet II but a lot cheaper.

112 **Konan TenTime Intelligent Disk Accelerator, CompuAdd HardCache/ESDI**
A pair of controllers that can speed up the transfer rates and average access times of your ESDI drives.

UPDATE

112 **Pageprinter II Model 031**
IBM's upgraded laser can switch automatically between PostScript and Series II and Proprinter XL emulations.

114 **Relay Gold 4.0**
The communications heavyweight adds mainframe graphics support, more terminal emulations, and a LAN version.

114 **Para-Mail 2.1**
With this RAM-frugal TSR in place, LAN users can have their E-mail and read it, too.

114 **QEMM-386 5.0, QEMM 50/60 5.0, QRAM**
New versions of this memory manager let you find new places to tuck your network drivers and TSRs.

116 **Norton Commander 3.0**
This DOS shell upgrade extends file viewing to 20 new programs and adds MCI Mail manager.

116 **Macola Accounting Software 4.0**
The big-league accounting package can post items and generate reports at preset times, unattended.

116 **Tree86**
This popular hard disk manager stores its information in expanded memory to free up conventional memory.

Pan Overseas' new Echo 386 comes standard with a mouse, streaming tape backup, a high-resolution VGA monitor, and factory-installed software.

Echo 386

Attention PC Shoppers: One-Stop Computing

If automobiles were sold like some PCs, you would buy a chassis and motor and pay extra for such "options" as a steering wheel, tires, and seats. But Pan Overseas has turned options into standard features by loading its new Echo 386 system with such "extras" as a mouse, a streaming tape backup device, a high-resolution monochrome VGA monitor, an uninterruptible power supply (UPS), and even factory-installed software.

Echo 386 models come in three different clock speeds—20, 25, and 33 MHz—all equipped with 1MB of 32-bit RAM, upgradable to 16MB via expansion boards that run at processor speed. For added sizzle, the 25- and 33-MHz systems are shipped with memory expansion boards and pack 32K caches (upgradable to 64K), which operate at 35ns and 25ns, respectively. All three motherboards support both the Intel 80387 and the Weitek 3167 math coprocessors.

The Echo 386's feature list starts with an 80MB hard disk with an 18ms average access time and a 1:1 interleave SCSI controller with a 2MB-per-second data transfer rate. The 16-bit VGA controller comes with 512K of memory and supports the whole spectrum of resolutions up to 1024 by 768 with 16 colors, as will the Pan Overseas 14-inch monochrome monitor (with grays instead of colors), which is interlaced at that mode but noninterlaced at the others.

Other standard features include a serial/parallel-port card, a 320-dpi mouse, an 80MB streaming tape backup drive, and a built-in UPS. Bundled software includes DOS 3.31, *Desqview 386*, *PC Tools 5.0*, and Pan Overseas Echosave software, all of which come preinstalled on the machine.

In the event of a power outage, the integrated UPS system in the Echo 386's 170-watt power supply keeps you working until the Echosave software has time to take a snapshot of your entire system setup and save it to a disk file. The next time you power up, Echosave restores the system as if nothing had happened.

The Echo 386 packs all this value into a space-saving box just 14¾ by 16½ by 6½ inches. After you install the VGA, the serial/parallel card, the disk controller, and a memory card, the 20-MHz unit has one 8/32-bit and three 8/16-bit slots left. The 25-MHz and the 33-MHz machines have one 8-bit and three 8/16-bit slots left.

The 20-MHz Echo 386 lists for $4395, the 25-MHz system costs $5995, and the 33-MHz machine retails for $7795. Pan Overseas Technologies, 44 Rt. 46, Pine Brook, NJ 07058; 201/808-1900.
—*Wes Nihei*

Reader service no. 695

Dauphin LapPro 386SX

The Whole 32 Bits In Your Lap

Thanks to Intel's 386SX chip, the LapPro 386SX is one of the first laptops to run 32-bit software under battery power. But be advised: It weighs in at a hefty 16.5 pounds.

If you've been dreaming about multitasking with *Windows/386* at 30,000 feet but have been put off by the price of battery-powered, 32-bit machines, Dauphin has a nice surprise for you. Its LapPro 386SX is one of the first to take advantage of Intel's 386SX chip to run 32-bit software under battery power—and at an affordable price. For $4229, you get a 16-MHz laptop with 2MB of RAM (expandable to 4MB), a 40MB hard disk, a 1200-bps modem, and a backlit EGA display.

The bad news is that at 16.5 pounds, this no-compromise carry-along is not for the weak of bicep. Add the recharger, and you'll be toting closer to 19 pounds, making the LapPro a heavyweight in more ways than one. But if you don't mind the exercise, you can rely on a respectable 2 hours of battery operation—not bad for this level of performance.

The system comes socketed for an 80387 math coprocessor and accepts an optional expansion chassis supporting standard expansion boards. Dauphin Technology Inc., 1125 E. St. Charles Rd., Lombard, IL 60148; 312/627-4027.
—*Michael Goodwin*

Reader service no. 700

Before you make any big decisions over which laser printer to buy, we'd like to point out a few little things about the new Canon LBP-4.

The first of which is size. Unlike most "desktop" printers that need a space the size of a football field to fit in your office, the LBP-4 is compact. So it actually fits on top of your desk.

It also fits your budget. With an equally compact price of only $1,545.*

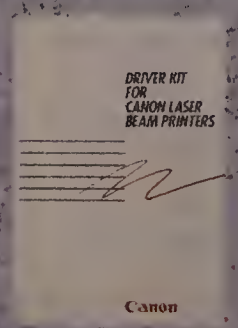
And it's the only laser printer in its class to offer built-in scalable fonts that let you set type from the smallest fine print to headline size. Without options or add-ons.

Plus a lot of other little extras that make it easy to print high-quality text and graphics right down to the smallest detail. Including Canon's convenient EP-L replaceable cartridge, and a versatile front-loading paper tray. It even prints envelopes.

So call toll-free 1-800-441-5454 or stop by your Canon Dealer and see an LBP-4 for yourself.

Very little to get

It's the first compact, affordable laser printer with scalable fonts, standard. And that's something to get excited about.



A printer driver kit is provided free with each new LBP-4 containing all printer definition files currently available for this printer on diskette, plus complete installation instructions.

*Manufacturer's suggested retail price.

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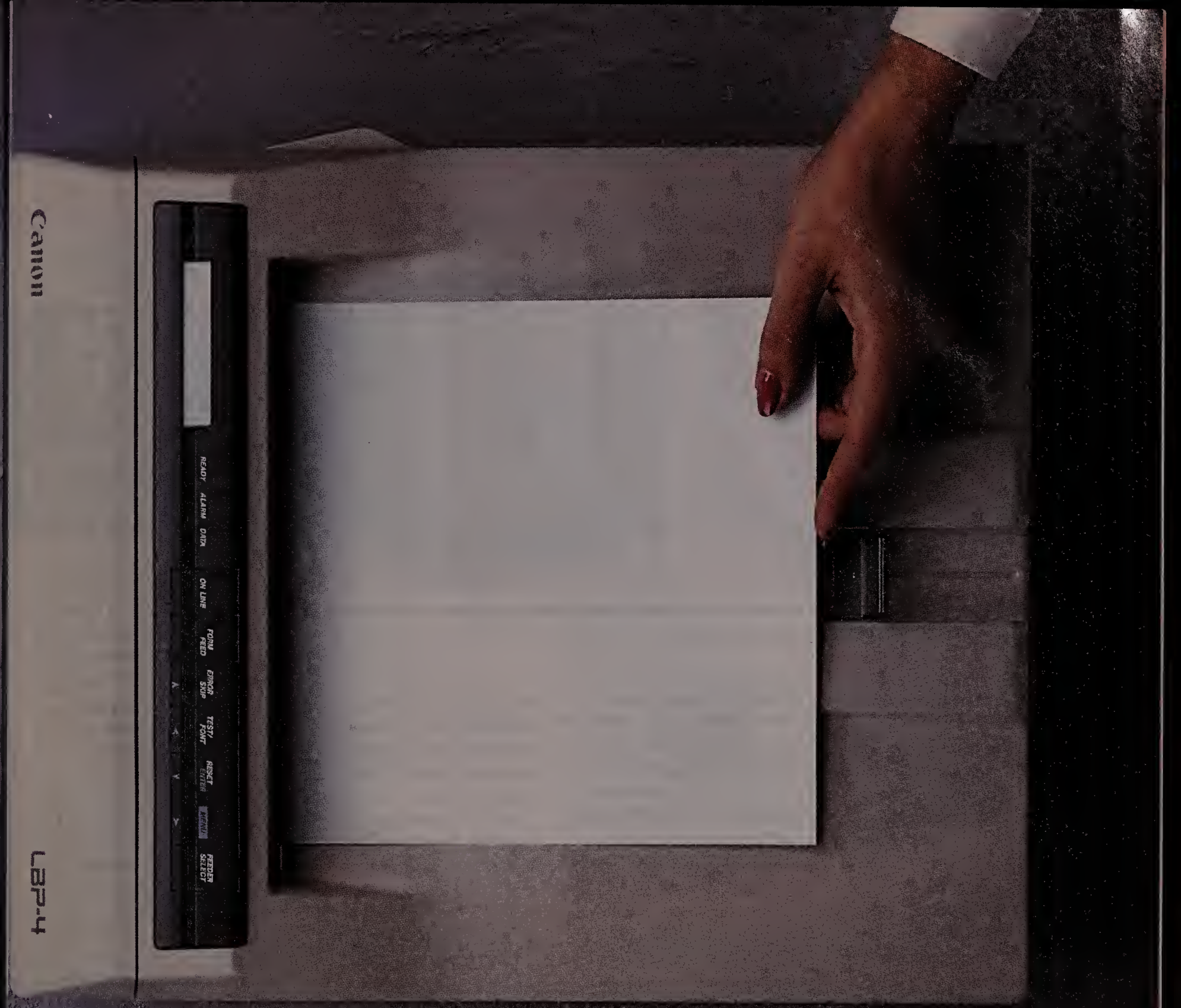

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MultiSync 4d and 5d Monitors, MultiSync Graphics Engine

Picture These Windows on the Graphics World

The MultiSync 5d and 4d color monitors let you see more of your graphics-intensive applications on screen and use a variety of graphics cards, resolutions, and column widths.

The job of configuring a system to run graphics-intensive applications like CAD or OS/2 Presentation Manager doesn't end with a few extra megabytes of memory and a fast 386 CPU. To run multiple applications effectively or discern the fine lines in your designs, you need as big a screen as you can afford.

NEC has two new MultiSync monitors that can do the job and a high-speed graphics coprocessing adapter to drive them. The 5d is a 20-inch-plus color monitor with microprocessor control that, in true MultiSync tradition, lets you use a variety of graphics cards, resolutions, and column widths with minimum hassle.

You adjust the size, position, and other image variables for the various frequencies just once, using the digital controls. After that, the controller recognizes the incoming scan, recalls your setting from memory, and resets itself. Maximum resolution is 1280 by 1024, but it also can sync in on VGA's 640 by 480, Super VGA's 800 by 600, noninterlaced monitors' 1024 by 768, and IBM's interlaced 8514/A standard.

The 16-inch 4d MultiSync monitor also has microprocessor-controlled digital controls that recall settings from memory. It has similar flexibility, supporting VGA, Super VGA, and both interlaced and noninterlaced 1024 by 768 resolutions.

NEC's MultiSync Graphics Engine (MGE) bridges the gap between VGA and the higher resolutions not usually supported by high-end graphics cards. The on-board TI 34010 graphics microprocessor, operating at 50 MHz and supported by up to 1MB of video memory and 768K of RAM, takes the load off the computer's CPU. Windowing applications, desktop publishing, big spreadsheets, and CAD applications that would bog down a fast 386 work smoothly even on a 10-MHz 286.

The MGE comes bundled with *AutoCAD* drivers and is compatible with software written to the OS/2 Presentation Manager, but not with programs that write directly to IBM 8514/A–style adapter hardware. Also, at $1499 and $1999 for 16-color and 256-color versions, respectively, the MGE costs about twice as much as those more common adapters. The 5d MultiSync monitor retails for $3699, the 4d for $1799. NEC Home Electronics Inc., 1255 Michael Dr., Wood Dale, IL 60191; 312/860-9500. — *Mark Henricks*

Reader service no. 696

Mitac MPC2000SL

The Bargain-Basement AT

There's something magical about the $1000 price point. As soon as a price tag drops below four digits, the box that it's attached to begins to take on a new—and more pleasing—appearance.

Whether you're looking for a low-cost LAN station at the office or an at-home AT, there's a lot to like about Mitac's new MPC2000SL, including the $999 sticker. The MPC2000SL replaces the company's Paragon 286S, a slightly smaller and less expandable box that came with more memory and better graphics—but at a price nearly 40 percent higher. Even with room for four drives, this bargain-basement PC's footprint is only 14½ by 16½ by 6½ inches. It comes with a 5¼-inch floppy drive installed and will accept a 3½-inch floppy and a 5¼-inch tape drive. And there's space for an internal 3½-inch hard drive in the base of the computer.

The system board houses an 80286 CPU—switchable between 6 MHz and 10 MHz—512K of memory expandable to 1MB, two floppy controllers, serial and parallel ports, and both Hercules and CGA graphics (the 286S had EGA graphics). A third-party expansion board can take you to 8MB; a hard-disk controller will occupy one of five available 8/16-bit slots. American Mitac Corp., 410 E. Plumeria Dr., San Jose, CA 95134; 800/648-2287. —*Mark Henricks*

Reader service no. 675

QUALITY BY DESIGN

WEEK *reports that PC Designs dominated the CORP COMPUTER POLL, receiving top marks in four categories:*
1.-Compatability with hardware and software 2.-Relative Performance 3.-Ease of Installation 4.-Ease of Configuration

GV286/120

- 80286 running at 12 MHz zero wait state.
- Proprietary, 32KB on-board RAM cache circuit using high speed (35ns) static RAM.
- 512KB RAM, expandable to 1MB on motherboard.
- Socketed for 8MHz 80287 math coprocessor.
- 5.25″ 1.2MB or 3.5″ 1.44MB floppy drive.
- Enhanced 101-key keyboard.
- Graphics adaptor features a full 256K of video RAM and 16-bit interface for full VGA capabilities on VGA Color System.
- 200-watt power supply.
- 2 serial/1 parallel port standard (on add-in card).
- ROM based set-up and diagnostics.
- Motherboard designed and manufactured in the U.S.A.
- Toll-free technical support.
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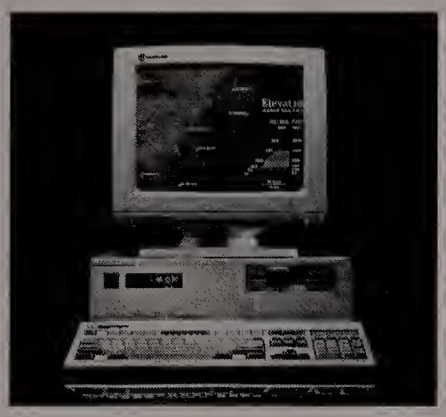
PC MAGAZINE EDITOR'S CHOICE
Oct. 13, 1987



GV286/20

- Choice of slimline or Baby "AT" desktop, space-saving footprints available.
- Top performance at lower cost.
- VLSI technology for increased reliability.
- 80286 running at 20 MHz zero wait state.
- Paged-interleave Memory Architecture.
- 1MB RAM standard, expandable to 2MB or 4MB configurations on motherboard.
- Socketed for 10MHz 80287 math coprocessor.
- 5.25″ 1.2MB or 3.5″ 1.44MB floppy drive.
- Enhanced 101-key keyboard.
- Graphics adaptor features a full 256K of video RAM and 16-bit interface for full VGA capabilities on VGA Color System.
- 200-watt power supply.
- 2 serial/1 parallel port standard (on add-in card).
- ROM based set-up and diagnostics.
- Motherboard designed and manufactured in U.S.A.
- Toll-free technical support.
- On-site Service for one year.

GV386/20 PLUS

- 80386 running at 20 MHz zero wait state.
- 1MB RAM on motherboard.
- System is capable of expanding to 16 MB of 32-bit RAM.
- Proprietary, 64KB on-board RAM cache circuit using high speed (35ns) static RAM.
- Socketed for 20MHz Intel 80387, or 20MHz Weitek 3167 math coprocessors.
- 5.25″ 1.2MB or 3.5″ 1.44MB floppy drive.
- 2, 8-bit, 4, 16-bit and 2, 32-bit memory expansion slots.
- Graphics adaptor features a full 256K of video RAM and 16-bit interface for full VGA capabilities on VGA Color System.
- 2 serial/1 parallel port standard (on add-in card).
- ROM based set-up and diagnostics.
- Motherboard designed and manufactured in U.S.A.
- Toll-free technical support.
- On-site Service for one year.

PC MAGAZINE "Overall, PC Designs' latest effort effectively integrates brand-name components and a proprietary motherboard to yield generally swift and solid performance. If you're in the market for a 386, this sytem is worth a look."
— PC MAGAZINE — May 30, 1989

GV386SX

- Run 32-bit operating systems, applications software, or Windows 386 at a lower cost.
- Slim-line, space-saving desktop configuration.
- 80386SX running at 16 MHz zero wait state.
- 2MB RAM standard, 4MB capacity on motherboard.
- Socketed for 16MHz Intel 80387SX, math coprocessor.
- 3.5″ 1.44MB floppy drive.
- VLSI technology for increased reliability.
- Graphics adaptor features a full 256K of video RAM and 16-bit interface for full VGA capabilities on VGA Color System.
- 2 serial/1 parallel port standard (on add-in card).
- ROM based set-up and diagnostics.
- Motherboard designed and manufactured in U.S.A.
- Toll-free technical support.
- On-site Service for one year.

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OPTIONS GV286/120

- RAM upgrades.
- Intel 80287 math coprocessor.
- MS-DOS 3.3. or 4.01.
- 256 VGA Video upgrade $79.

NEW PRICES	TTL Mono	800 X 560 VGA Color
20MB, 65ms, WD 1:1	$1,399	$1,949
44MB, 23ms, WD 1:1	$1,599	$2,149
71MB, 27ms, WD 1:1	$1,799	$2,349
155MB, 18ms, ESDI	$2,499	$3,049
320MB, 18ms, ESDI	CALL	CALL

OPTIONS GV286/20

- RAM upgrades.
- Intel 80287 math coprocessor.
- MS-DOS 3.3. or 4.01.
- 256 VGA Video upgrade $79.

NEW PRICES	TTL Mono	800 X 560 VGA Color
20MB, 65ms, WD 1:1	$2,099	$2,649
44MB, 23ms, WD 1:1	$2,299	$2,849
90MB, 18ms, ESDI	$2,799	$3,349
155MB, 18ms, ESDI	$3,199	$3,749

OPTIONS GV386/20 PLUS

- RAM upgrades.
- 20MHz Intel 80387 and 20MHz Weitek 3167 math coprocessors.
- MS-DOS 3.3. or 4.01.
- 256 VGA Video upgrade $79.

NEW PRICES	TTL Mono	800 X 560 VGA Color
20MB, 65ms, WD 1:1	$2,349	$2,899
44MB, 23ms, WD 1:1	$2,549	$3,099
71MB, 27ms, WD 1:1	$2,749	$3,299
155MB, 18ms, ESDI	$3,449	$3,999
320MB, 18ms, ESDI	CALL	CALL

OPTIONS GV386SX

- RAM upgrades.
- 16 MHz Intel 80387SX math coprocessors.
- MS-DOS 3.3. or 4.01.
- 256 VGA Video upgrade $79.

NEW PRICES	TTL Mono	800 X 560 VGA Color
20MB, 65ms, WD 1:1	$1,999	$2,549
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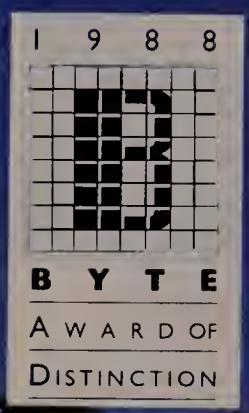
We've been recognized for being outstanding in our field because we're committed to our customers. We founded Gateway 2000 to provide *quality computers at aggressive prices with uncompromising service after the sale*. We've done what we set out to do.



Gateway computer systems are assembled by hand in our factory located just outside Sioux City, Iowa. The midwest work ethic is evident in every computer we produce. You'll also find the latest technology in all of our systems.

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- 1.44 Meg 3.5" Drive
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- 16 Bit VGA Board
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Citizen GSX-140

24-Pin Dot Matrix Capabilities: Hounding 9-Pins Out of Existence

Nine-pin dot matrix printers used to be your pocketbook's best friend. But 9-pins are headed for their dog days, thanks to low-end 24-pin printers that offer rock-bottom pricing, letter-quality output, and an array of features.

The GSX-140 is the latest in Citizen America's breed of low-end 24-pin devices that give you comprehensive paper handling, front-panel operation, and a two-year warranty for only $499.

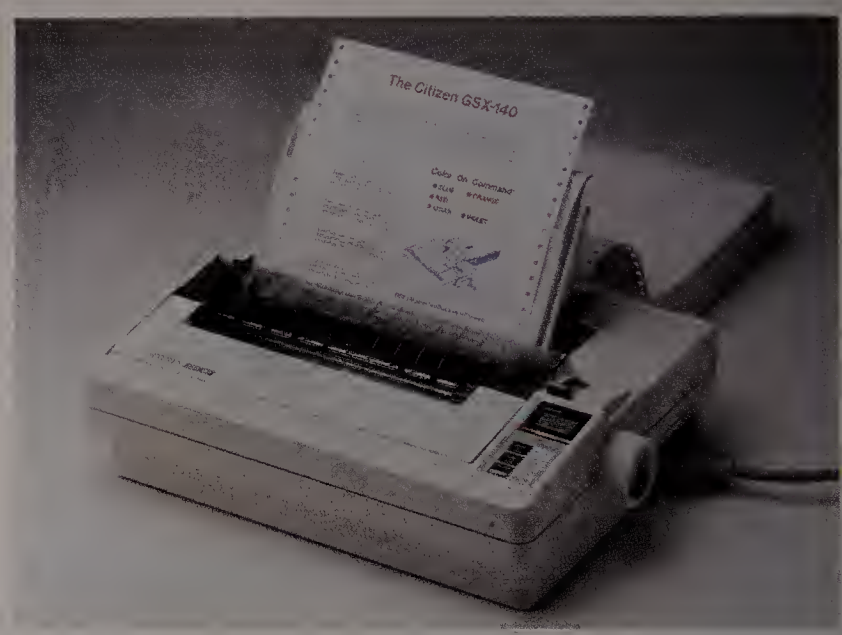
For everyday printing tasks, the GSX-140 falls back on a solid dot-matrix pedigree. There are two high-speed draft modes: 192 characters per second (cps) at 12 characters per inch (cpi) and 160 cps at 10 cpi. The printer also has a 64-cps letter-quality mode and produces 360-by-360-dpi graphics. Its 8K buffer is expandable to 40K, and you get six resident fonts in addition to Epson LQ series and IBM Proprinter X24 emulations.

The GSX's paper-handling features are similarly diverse. The printer sports a programmable top-of-page feature, paper parking, and a continuous-paper tear-off feature that automatically advances forms to the tear bar. A copy mode increases printing force for legible printing on multipart forms, while the GSX's push/pull tractor handles rear paper feed or bottom feed (a bottom feed slot is standard).

No need to configure with DIP switches or even software-based menus; the front-panel, 16-character LCD will prompt you through all printer settings. A Quick Mode feature lets you quickly run a macro, change fonts, switch pitches, or choose colors. You can store and run up to 4 macros from the front panel, but the Command Vue software utility lets you create and store 25 more macros, which you can run from the PC. Citizen America, 2401 Colorado Ave., Santa Monica, CA 90404; 213/453-0614.

—*Wes Nihei*

Reader service no. 701



The GSX-140 is a 24-pin dot matrix printer that can be your pocketbook's best friend. For only $499, you get comprehensive paper handling, two high-speed draft modes, a 64-cps letter quality mode, and 360-by-360-dpi graphics.

Computerized Classic Bookkeeping

Excel Puts a New Slant on Old-Style Accounting

Most accounting software is built on a data base. *Computerized Classic Bookkeeping* starts with *Windows*-based *Excel* spreadsheets and takes it from there. Written entirely in *Excel*'s macro language, the program operates like manual one-write bookkeeping methods (hence, "classic"). *CCB* doesn't post your entries straight to the general ledger. Instead, items are posted to separate cash disbursement, cash receipt, general, special, and wage accrual journals. Only the bottom line of each journal goes to the general ledger, which better organizes and simplifies the GL. *CCB*'s detailed on-screen analysis and auditing capabilities make it a snap to sort disbursement journal checks by type and date to find costs that may be out of line.

You can create special worksheets to figure depreciation or amortization, then integrate the results into the general ledger. You need to know *Excel*. But the payoff is being able to do repetitive data-entry tasks more quickly as well as use the unmatched graphics capabilities to spiff up all those new reports you'll be generating.

Fully equipped, including accounts receivable and payable, inventory, and check- and invoice-printing modules as well as all required journals, *CCB* costs $1295. It will handle up to 5000 customer accounts, vendor accounts, or items of inventory—about enough for a $10-million-a-year business. A smaller version to handle client write-up for accountants and bookkeepers is $695; a construction job costing program is $295; and a payroll and check-printing module is $595.

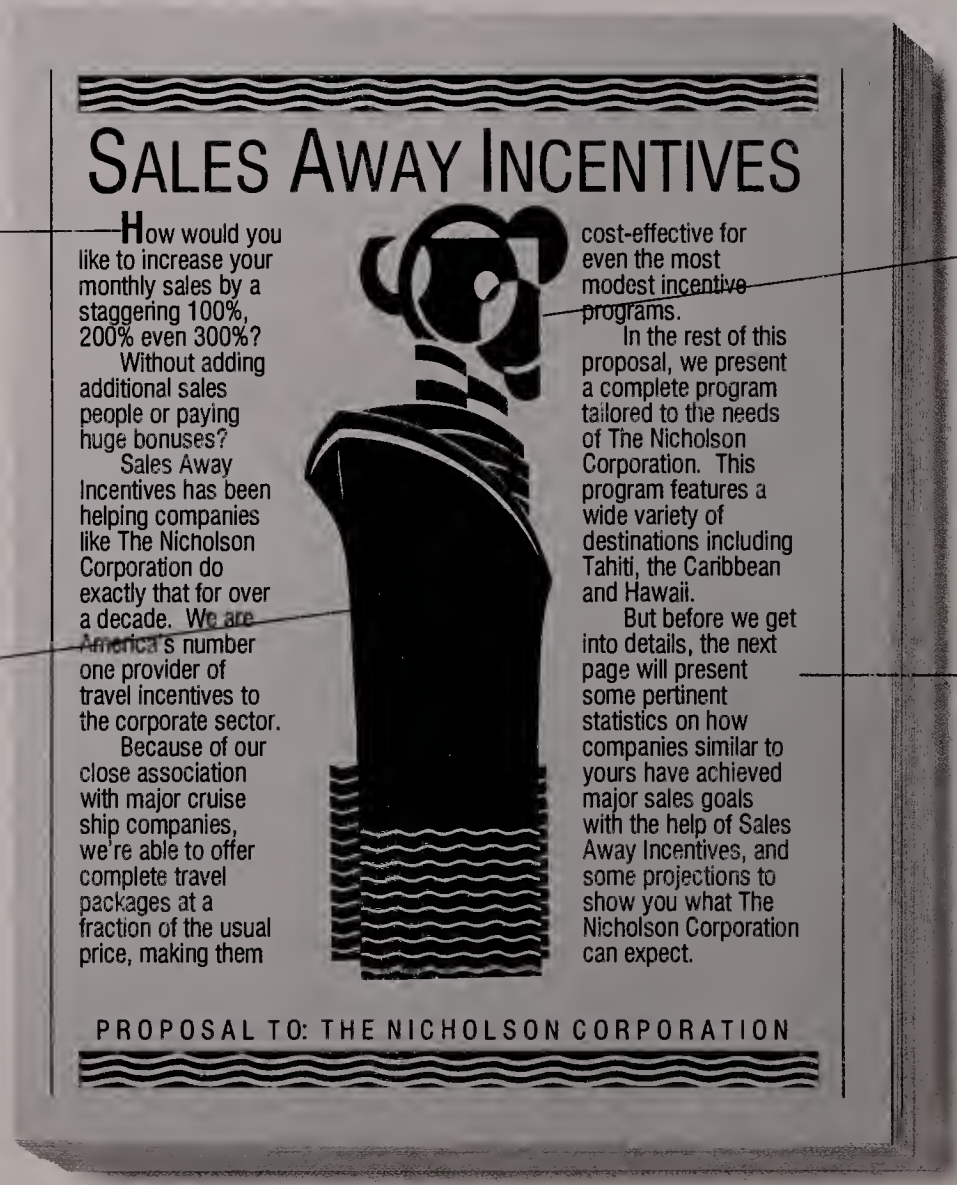
CCB requires DOS version 3.0 or later; *Windows; Microsoft Excel 2.1;* 2MB of memory on a 286, 3MB on a 386; a 20MB hard disk; and EGA, VGA, CGA, or Hercules graphics. A Microsoft Mouse is recommended. Absolute Solutions Inc., 3142 Vista Way #400 Oceanside, CA 92056; 800/633-7666, 800/458-3399, 619/966-8000.

— *Mark Henricks*

Reader service no. 697

Before
releasing
MultiMate 4.0
we set
some
serious
business
goals.

First, we had to show a graphic improvement in the product.



Create nearly any font size.

Import graphics from most popular file formats.

Easily integrate graphics into your document.

Design documents with multiple columns.

For years, MultiMate® from Ashton-Tate® has been a corporate standard for word processing.

And now MultiMate 4.0 is setting a new standard with a host of innovative features.

One of the most visible of which is integrated graphics with text.

Now, by simply using a pull-down menu, you can add images to your documents. Charts, illustrations, photographs, logos—virtually anything you can create or scan can now be imported into MultiMate.

Including graphics from programs like APPLAUSE II,™ Harvard Graphics, Lotus Freelance, Lotus 1-2-3, and PC Paintbrush.

You can even modify existing graphics by using MultiMate's extensive editing tools for cropping, sizing, rotating, adding borders and more. Or use the built-in tools to create your own graphics.

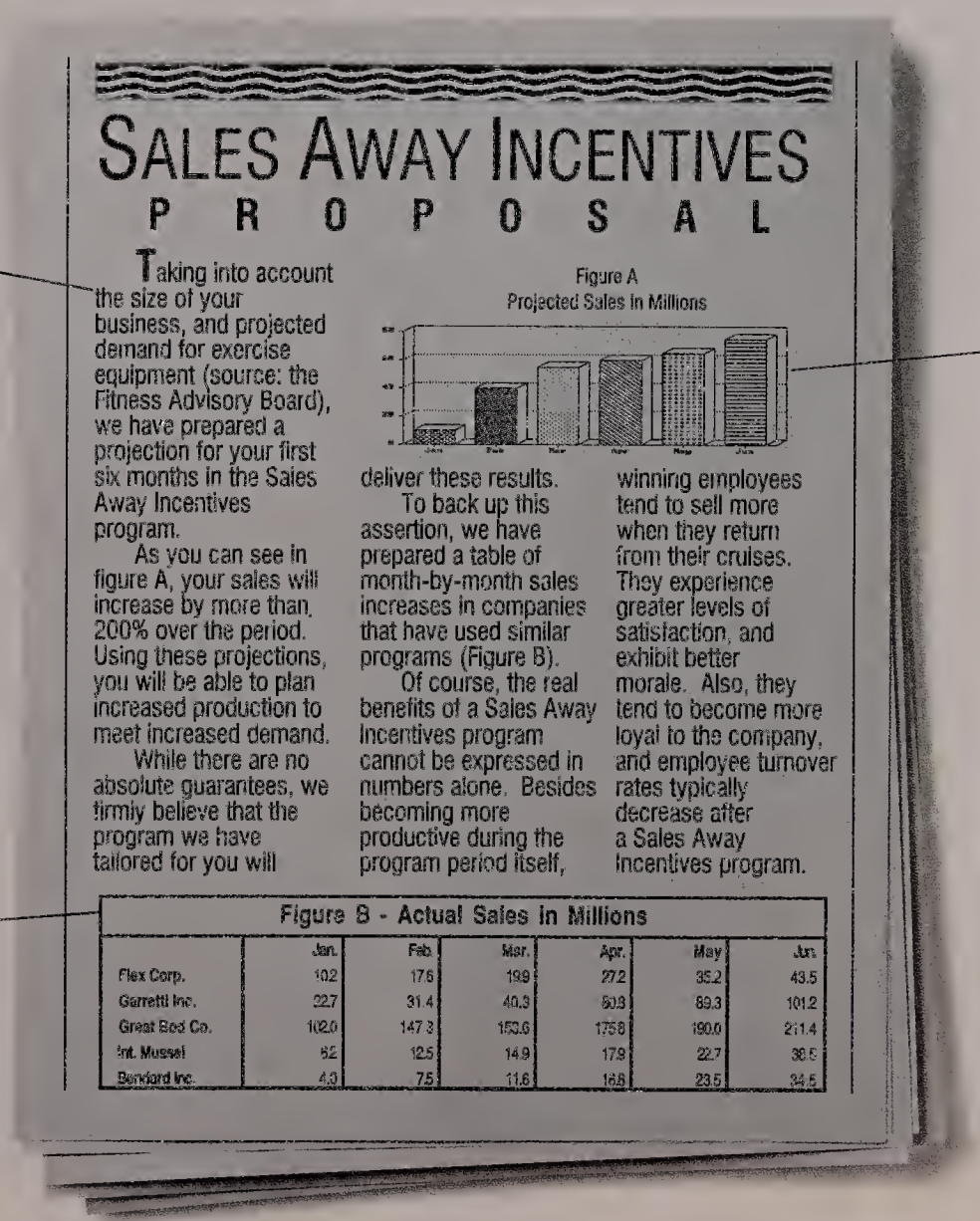
Of course, to make MultiMate one of the most powerful and versatile word processors of all, we had to show the world more than just a graphic improvement.

Next, we had to become a leader in the import/export business.

Text can be transparently imported from other popular word processors in editable form—without complicated conversions.

You can import charts based on dBASE IV data.

Tables can be imported from your spreadsheets.



SALES AWAY INCENTIVES

P R O P O S A L

Taking into account the size of your business, and projected demand for exercise equipment (source: the Fitness Advisory Board), we have prepared a projection for your first six months in the Sales Away Incentives program.

As you can see in figure A, your sales will increase by more than 200% over the period. Using these projections, you will be able to plan increased production to meet increased demand.

While there are no absolute guarantees, we firmly believe that the program we have tailored for you will deliver these results.

To back up this assertion, we have prepared a table of month-by-month sales increases in companies that have used similar programs (Figure B).

Of course, the real benefits of a Sales Away Incentives program cannot be expressed in numbers alone. Besides becoming more productive during the program period itself, winning employees tend to sell more when they return from their cruises. They experience greater levels of satisfaction, and exhibit better morale. Also, they tend to become more loyal to the company, and employee turnover rates typically decrease after a Sales Away Incentives program.

Figure A
Projected Sales in Millions

Figure B - Actual Sales in Millions

	Jan.	Feb.	Mar.	Apr.	May	Jun.
Flex Corp.	10.2	17.6	19.9	27.2	35.2	43.5
Garretti Inc.	22.7	31.4	40.3	50.8	89.3	101.2
Great Bed Co.	102.0	147.3	153.6	175.8	190.0	211.4
Int. Mussel	6.2	12.5	14.9	17.9	22.7	30.5
Benklard Inc.	4.0	7.5	11.6	16.8	23.5	34.5

Because we don't believe in boundaries between word processors, we gave new MultiMate 4.0 one of the most powerful conversion capabilities in the business. So now you can transparently import documents from other popular word processors--or export to their formats.

In seconds. Without complex conversions. And without losing paragraphs, footnotes, headers or any other formatting information.

Now over 30 of the most popular file formats can quickly appear in MultiMate in editable form—ready for you to work on. And files from any subdirectory on your computer can be imported or exported through simple keystrokes.

Our import policy also extends to spreadsheets and databases like Lotus 1-2-3 and dBASE IV.™

So no matter what you need—whether it's pictures, words or numbers—all you need is MultiMate.

Then, we had to find a faster way to deliver the mail.

Now you can send or receive electronic mail through simple pull-down menus, without leaving your document.

Once E-Mail is highlighted, all your options are instantly displayed in a sub-menu.

You can also communicate with PROFS, DISOSS, DEC All-In-One, and Wang Office through available gateways.

Our next goal was to build fast electronic mail capability into MultiMate itself. So you could send messages or documents across the office or across the world instantly—without leaving your word processor.

Now with MultiMate, you can exchange mail within a LAN network. Or via gateways to systems like DEC All-In-One, DISOSS, IBM PROFS, Wang Office and other MHS-compatible services. You can even communicate with FAX and public mail services. And with a modem, you can access these systems from non-networked or remote locations as well.

Best of all, you can do all this through pull-down menus that let you access any communication task with a single keystroke.

And you're not limited to sending MultiMate files alone. You can use the E-Mail function to send files created in dBASE III PLUS,™ dBASE IV,™ Lotus 1-2-3, Framework III® and many other popular formats.

In fact, by using document conversion, you can mail almost any file.

Which means that MultiMate is the only program you need when you want to express yourself.

Anywhere in the world.

Of course, we had to make it so easy even the boss could use it.

How do you make corporate America's easiest word processor even easier to use?

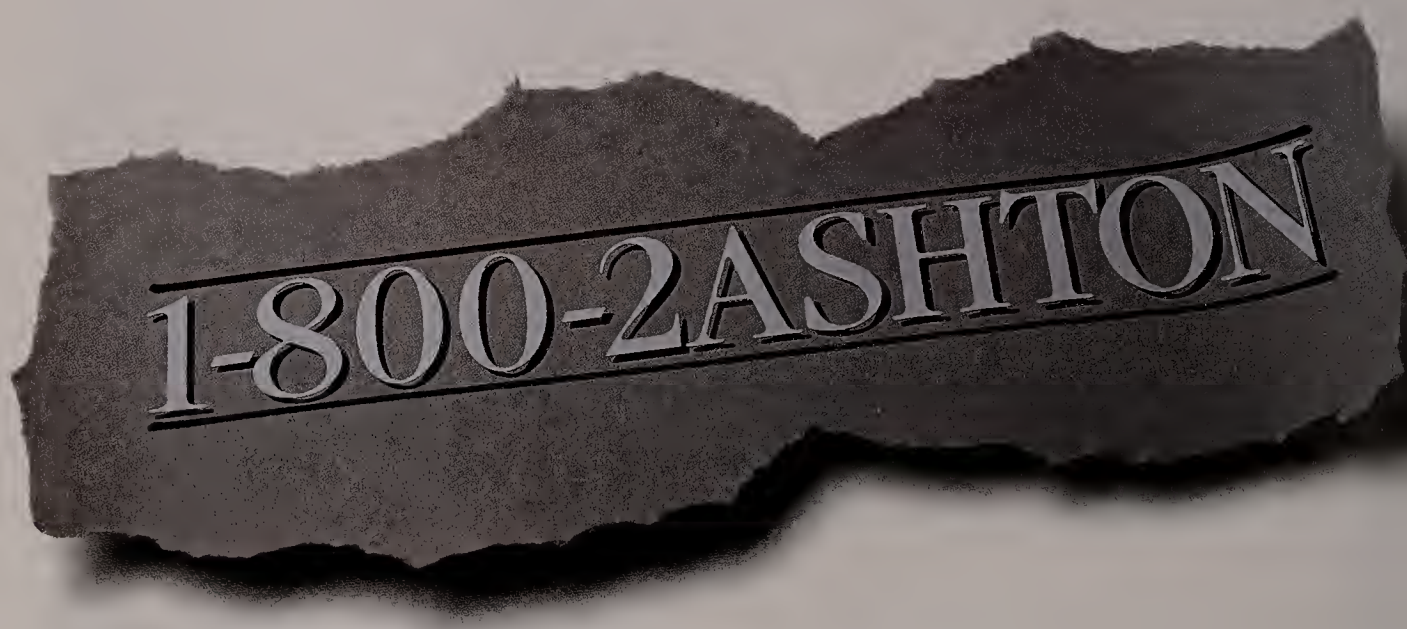
You put virtually every one of its functions on simple pull-down menus.

Then you display the keystroke equivalents on the same menus. Which makes learning MultiMate easy for anyone.

We've even made it easier for you to deal with other applications. Because now you can access spreadsheets or databases without leaving MultiMate. When you're finished, you'll automatically return to where you left off in your document.

But even with all these improvements, we still weren't finished with MultiMate.

Finally, we had to make it as easy to get as it is to use.



Now the easiest-to-use word processor is easy to upgrade. By calling 1-800-2ASHTON, current users can upgrade for only $75.

And if you're not a current user, or just want to learn more, call 1-800-437-4329 ext. 1903.

We'll send you additional information about the goals we've achieved with new MultiMate.

You'll learn about new features like integrated grammar checking (Grammatik™ IV) which automatically uncovers most grammar and style errors, and suggests corrections. Redlining and line numbering for legal documents. Enhanced mail merge for RapidFile® and dBASE® software. Free Bitstream® screen and printer fonts and much, much more.

So call now. And see how MultiMate can help you achieve your business goals.

Ashton-Tate®

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The New Tandy® 4000 SX

386™ performance at a price you'd expect from a 286 system.

A price/performance breakthrough for 386-based systems, the new Tandy 4000 SX combines more integrated features than ever before in a machine at this price.

The Intel® 80386SX microprocessor combines the ability to operate high-performance 80386 based software, as well as current 80286 and 8088 based software. You get the combination of 32-bit performance with 16-bit hardware compatibility.

This means the Tandy 4000 SX insures your computer investment for the future. As a low-cost alternative to an expensive 386 system, you won't be left behind when you want to move on to more advanced 386 based applications, like MS® OS/2.

Built-in VGA graphics give you beautifully detailed, high-resolution displays. Add a color analog monitor and create astonishing graphics using a palette of 256,000 colors for near-photographic clarity.

The 4000 SX's SmartDrive™ Integrated Drive Electronics (IDE) technology allows you to add high-performance hard disk drives without installing a separate disk controller.

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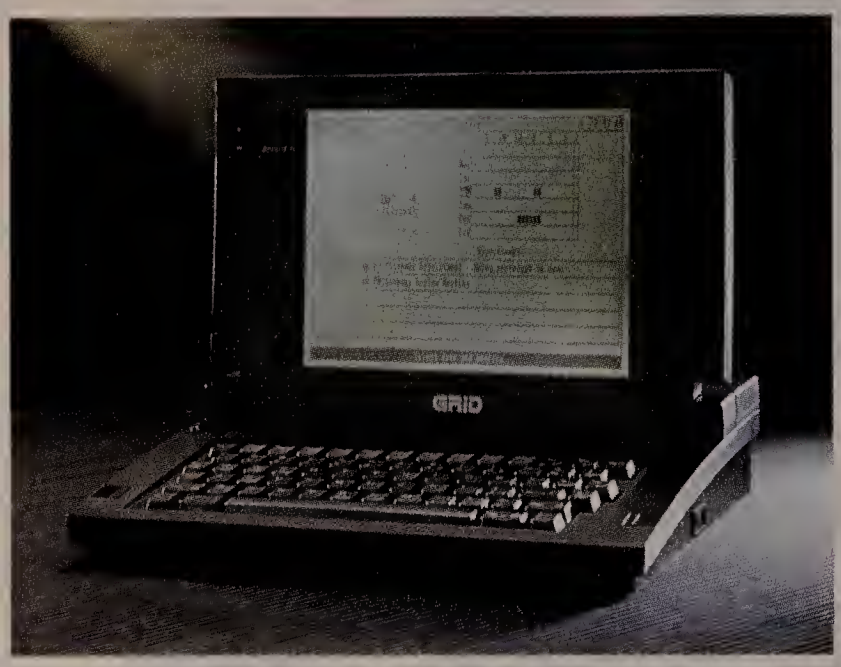
Circle 263 on reader service card

GridLite XL

Grid Buys Laptop Users (Almost) Free Lunch



The 9.5-pound GridLite XL is a lightweight laptop that doesn't make you sacrifice storage standards. Its new display technology and a low-power hard drive give you up to 4 hours of battery-powered operation.

Laptops are getting amazingly light, but for the most part, TANSTAAFL (There Ain't No Such Thing As A Free Lunch) still holds. Most of the new ultralight laptops get that way by forcing you to sacrifice familiar and reliable storage standards in favor of proprietary alternatives. Hard and/or floppy drives weigh a lot, use a lot of power, and strain the form factors of these diminutive PCs.

But Grid figures that convenient storage is something you just aren't willing to forgo, and so it has found ways to take its new GridLite XL down to 9.5 pounds without limiting you to ROM cards or undersize floppies. Built around an 8-MHz 80C86 CPU, the GridLite XL can be outfitted with either a 1.44MB floppy or a standard 20MB hard disk. The trade-off here is that you must choose between the hard disk and the floppy drive (fractionally heavier) because in this weight class, there isn't room for both.

If you have the hard-drive model, you can buy a $350 external floppy drive or transfer data between the XL and another computer using one of the popular serial data transfer programs.

The XL features a high-contrast CGA display that provides high readability without battery-draining backlighting. Thanks to the new display technology and a low-power hard drive, the XL promises up to 4 hours of battery-powered operation when you're away from the wall plug.

RAM can be expanded to 2MB, and the Grid XL sports eight ROM slots on the motherboard to accommodate up to 1MB of ROM-based software without sacrificing that precious hard disk space. ROM-based versions of DOS 3.3, *Crosstalk XVI*, and Grid's own communications, word processing, and desk utilities applications are currently available for $300 each.

The system starts at $1950 with 128K of memory and a floppy drive; DOS 3.3 is $165 extra; for $3575, you can get 640K of RAM, a hard drive, and DOS. You can also choose either a Hayes-compatible 2400-bps modem for $595 or an MNP version that supports hardware-based error correction and data compression for $695. Grid Systems Corp., 47211 Lakeview Blvd., P.O. Box 5003, Fremont, CA 94537-5003; 415/656-4700.

—*Michael Goodwin*

Reader service no. 703

XPort

Sweet Solution for Graphics File Conversion

The penniless kid outside the candy store was not more frustrated than the graphics user who found a co-worker with just the image he needed—but in a format incompatible with his graphics application. Micrografx's new graphics file transfer utility can help satisfy your hunger for more and varied graphic images.

XPort employs a hub-and-spoke scheme to let you bring the file that you want into the format of your current application. You can translate Lotus *Freelance* CGM versions 2.0 and 3.0 and *AutoCAD* DXF as well as Macintosh MAC-PIC I and II, Digital Research *GEM*, and Micrografx's own .DRW and .GRF formats into the common vector-oriented format of *XPort*'s hub. Once there, graphics files can be sent back out to any of the "spokes."

Many desktop publishing packages can import and/or export two or three of these formats, but *XPort* provides a sweet one-stop solution that can cut through a lot of the program swapping and can even be automated through the use of batch files. *XPort* does a truer job of conversion than most import utilities, supporting, for example, both *Freelance Plus* and *Harvard Graphics* versions of CGM.

The $249 program requires at least an 80286-based computer running *Microsoft Windows* atop DOS version 3.0 or later, and 640K of memory, but it ships with a run-time version of the operating environment. Micrografx Inc., 1303 E. Arapaho Rd., Richardson, TX 75081; 800/272-3729.

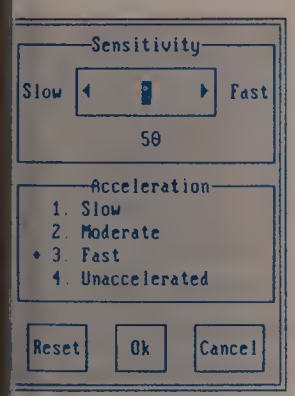
—*Mark Henricks*

Reader service no. 702

This is all the space you need to operate the new Microsoft Mouse.

Here's the first thing you should do with the new Microsoft® Mouse.

Bring up the expanded control panel. Set it for "Fast." And then, with a very slight movement of your hand, watch the cursor scoot all the way across the screen.



You're in complete and total control with the new, expanded control panel.

You'll be hooked.

And don't worry about control. We upped the resolution to an extremely accurate 400 points per inch. In other words, the cursor practically reads your mind.

To help even more with accuracy, the tracking ball is in front. And the patented design fits comfortably in your hand.

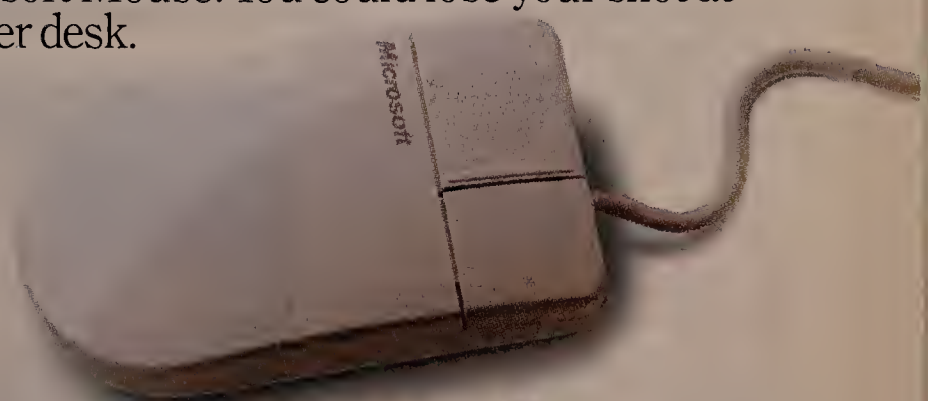
What it all means is you get more out of your software. By being able to quickly and efficiently click through even the most sophisticated applications.

In fact, we put OS/2 support in our upgraded driver. Making the Mouse ready for whatever the future of software brings.

To complete the package, you also get a choice of Microsoft Windows/286™ or Microsoft Paintbrush,™ two valuable Mouse programs.

So visit your Microsoft dealer for more details and a complete demonstration.

Now, you may not want to let your boss know just how little room you need for a Microsoft Mouse. You could lose your shot at a bigger desk.



Microsoft®

Making it all make sense™

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GammaScript

PostScript Output for Fax

Now you can get PostScript-quality output from your fax machine. *GammaScript* from GammaLink enables users of the GammaFax board to create presentation-quality faxes with any application program that supports Adobe's page-description–language standard.

GammaScript converts a PostScript printer file into a standard fax file and transmits it by means of a GammaFax board (you also need a GammaFax at the other end). The result is a fax transmission with 200-dpi (the group III fax standard) PostScript text and graphics. You can display a file, trim it, flip it, rotate it, and cut and paste data. The program will also convert the file into .PCX and TIFF formats so that you can edit graphics with a paint program.

GammaScript employs UltraScript, the PostScript interpreter clone from QMS, as a core technology, but it also can translate HPGL and *AutoCAD* plotter files into fax files. The program comes in two configurations. Standard *GammaScript* for $440 offers 35 typefaces and Apple LaserWriter NT compatibility. A stripped-down version for single users called *GammaScript Starter* offers 13 typefaces and compatibility with the Apple LaserWriter for $145. You can upgrade *Starter* by purchasing additional fonts for $295.

GammaScript's hefty hardware overhead requires a 286-based PC or better, DOS version 3.0 or later, 1MB of memory, 4MB of hard disk space, and a GammaFax board, the cheapest of which is $495. GammaLink, 2452 Embarcadero Way, Palo Alto, CA 94303; 415/856-7421. —*Wes Nihei*

Reader service no. 705

GammoScript lets users of GommaFax PC-to-fax boards swap presentotion quolity PostScript-compatible transmissions.

Epson EPL-6000 Laser Printer

Undercutting the LaserJet in Price and Speed

Longing for laser-quality text and graphics but put off by laser printer prices? Impact printer impresario Epson America has joined a growing number of vendors who are trying to take a sliver of the nonimpact market from Hewlett-Packard's LaserJet Series II by offering lasers that are slightly slower but considerably cheaper.

The Epson EPL-6000 is a 6-ppm printer that produces 300-dpi text and graphics from a compact 16-by-15-by-8-inch box for an equally downsized list price of $1899. A Tokyo Electric Company (TEC) engine runs the show under the guidance of a controller based on the 10-MHz Motorola 68000 processor.

The EPL-6000 comes with six resident fonts, but its two cartridge slots give you access to the entire range of HP's LaserJet-compatible soft fonts. It supports HP's Printer Command Language Level 4, but, ironically, a cartridge emulating Epson's own FX language will cost you extra.

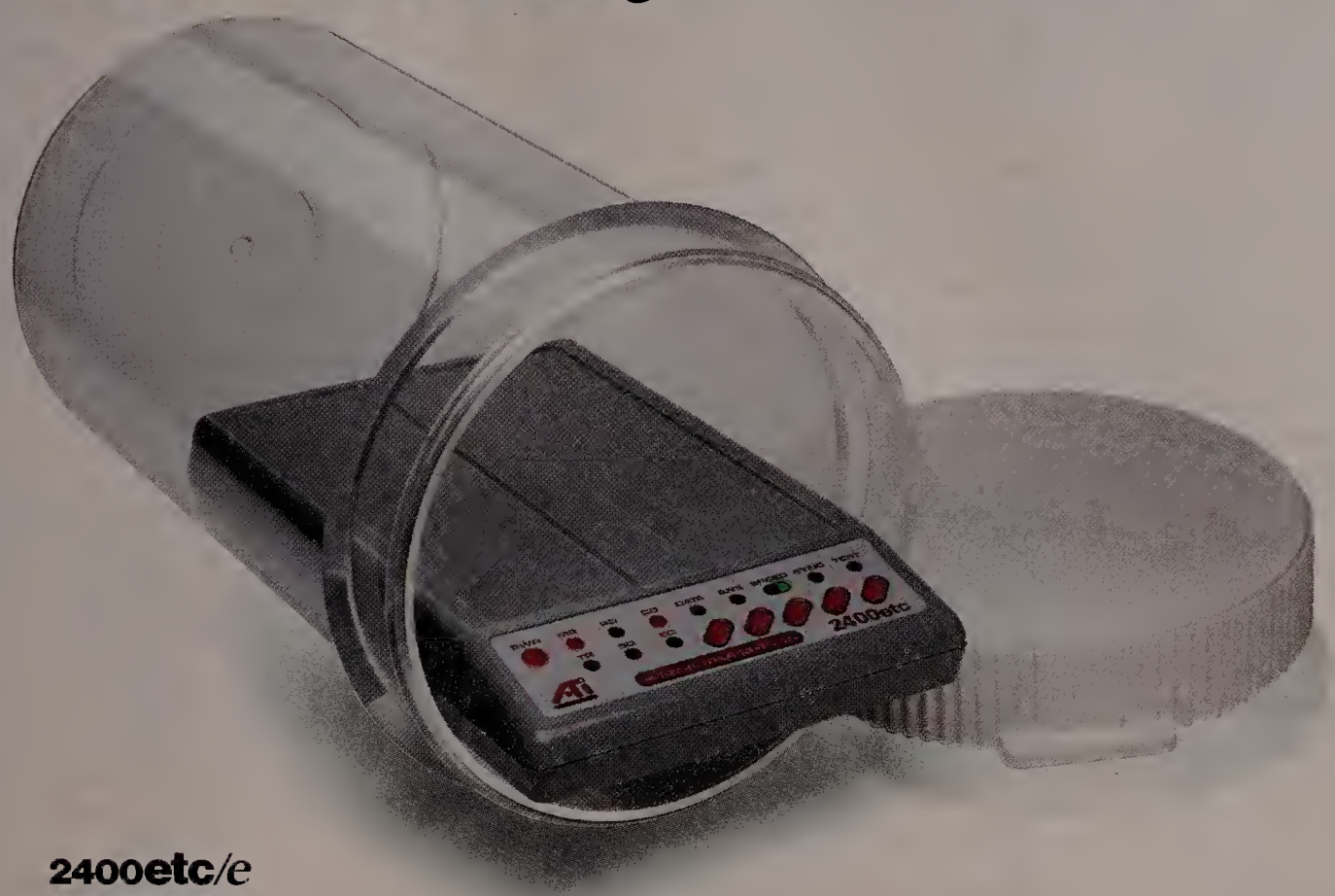
You can upgrade the EPL-6000's 512K of memory to 4.5MB by installing in its one slot an $899 2MB memory board that has room for another 2MB. The TEC engine has a monthly duty cycle of 3000 sheets, and a 300,000-sheet life. Unlike with the Series II, the toner cartridge and print drum are separate units—you don't have to change one just because the other is finished. Consumables are the standard 3 cents per page, just like with the LaserJet.

The EPL-6000's 150-page cassette adjusts automatically to handle letter-, legal-, and A4-size paper as well as transparencies, labels, and envelopes. The EPL-6000's paper sensor automatically adjusts temperature and toner density according to paper thickness or whether you're using transparencies or labels. Epson America, 23530 Hawthorne Blvd., Torrance, CA 90505; 800/421-5426, 213/539-9140. —*Wes Nihei*

Reader service no. 699

The 6-ppm Epson EPL-6000, o slightly cheaper olternotive to the 8-ppm Hewlett-Packard LaserJet Series II, gives you access to the entire range of LaserJet-compatible soft fonts.

Cure Hayes fever.



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Circle 22 on reader service card

Konan TenTime Intelligent Disk Accelerator, CompuAdd HardCache/ESDI

Controllers That Get the Most From ESDI Drives

With CPUs busting speed limits left and right, hard disk drives need to put the pedal to the metal just to keep up. Konan's TenTime Intelligent Disk Accelerator and CompuAdd's HardCache/ESDI controllers can punch up the transfer rates and average access times of your ESDI drives.

Konan's TenTime Intelligent Disk Accelerator with caching boosts the 1000-kilobytes-per-second (Kps) normal data transfer rates of a 10-megabit-per-second (mbps) ESDI drive to 2200 Kps and pares down the usual 28ms average access time to a negligible 5ms. It comes in a variety of configurations that start with 512K of 100ns on-board read-only cache RAM expandable to 16MB. For example, the TenTime for a 10-mbps ESDI drive costs $995 with 512K, while a 512K version for a 15-mbps ESDI hard drive costs $1295.

Equipped with a four-year lithium battery for delayed write caching, the disk accelerator automatically backs up the on-board static RAM, so you can restore system data from its cache if your PC suffers a sudden power loss. And you can set the TenTime to automatically write data to a second, identical disk drive for painless backup. Konan, 1829 W. Drake Dr. #103, Tempe, AZ 85283; 602/345-1300. —*Wes Nihei*

Reader service no. 707

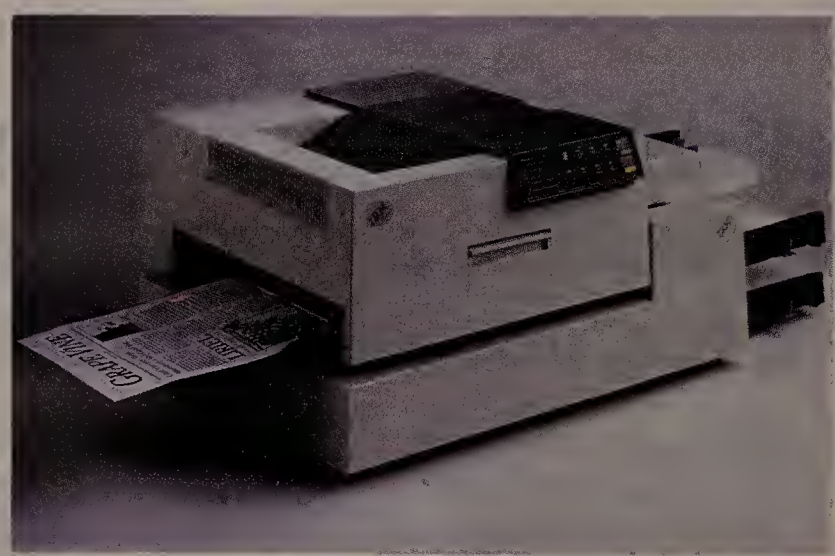
Meanwhile, CompuAdd claims that its Intel 80188-based HardCache/ESDI integrated controller and hard disk cache clocks in with 2400-Kps data transfer rates and .3ms average disk-access time. HardCache versions are available with either 256K or 1MB of 100ns RAM installed. But because the board has three slots for additional user-installable SIMMs, you can bring the 256K version up to a maximum of 1MB of cache and the 1MB version up to a total of 4MB.

The HardCache supports two floppy and two 10- or 15-mbps ESDI drives. Prices range from $495 for a controller with 256K RAM to $1760 for a fully populated 4MB version. CompuAdd Corp., 12303 Technology Blvd., Austin, TX 78727; 512/250-1489. —*Wes Nihei*

Reader service no. 708

Pageprinter II Model 031

New Laser Features, Same Price



IBM's new Pageprinter II Model 031 has more resident fonts than the Model 030 and improved paper handling, and it lets you switch between PostScript and the other emulation modes.

Early this year, IBM unveiled its all-purpose PostScript solution, the Personal Pageprinter II Model 030, which teamed Adobe PostScript with HP LaserJet Plus and IBM Proprinter XL emulations. Now Big Blue has given the heave-ho to the Model 030 in favor of the Model 031.

The Model 031's printing punch comes from the same 6-ppm Ricoh 1060 engine and a 16.67-MHz Motorola M68000 processor. You get a standard 2MB of RAM, upgradable to 4MB with a $1495 memory card.

Improvements include more resident PostScript fonts and souped-up paper-handling options. But the Model 031's major advantage is its automatic emulation-hopping capability which, thanks to a new version of the Adobe PostScript interpreter, switches back and forth between PostScript and the emulation modes as needed. You install the printer's Windows-compatible device driver, which sets up separate logical printer ports for each emulation. At print time, the driver detects the emulation and automatically channels output though the proper port to the printer.

Other extras include four additional Helvetica type styles that boost the Pageprinter II's total resident PostScript fonts to 47. To IBM's credit, the Model 031 dispenses these extras without inflating the old $4999 price. If you invested in a Model 030, you can get a Model 031 upgrade kit for $750.

The Model 031 also supports a $1395 sheet feeder with two 200-sheet paper trays and an envelope tray for 50 envelopes. You can feed single sheets with all trays in place. IBM, 900 King St., Rye Brook, NY 10573; 800/447-4700. —*Wes Nihei*

Reader service no. 709

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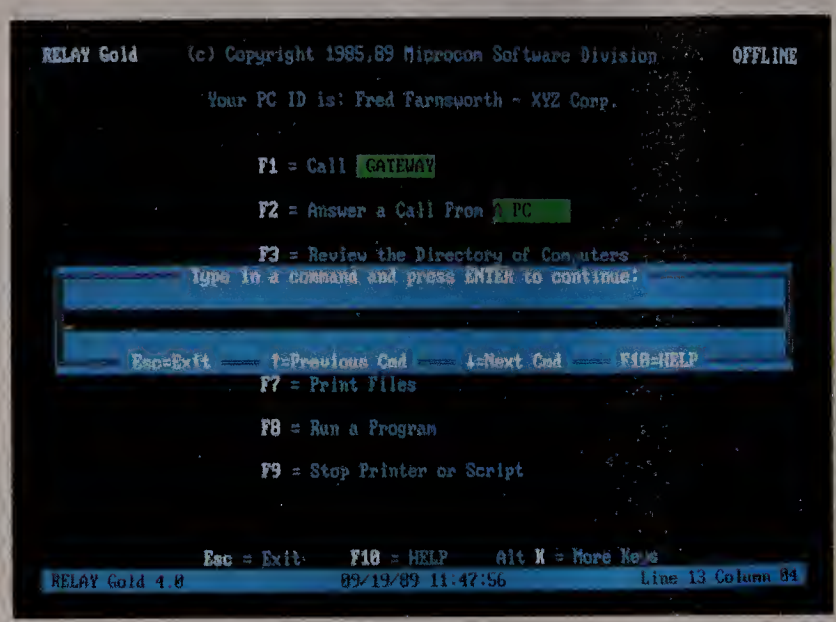
Circle 148 on reader service card

Relay Gold 4.0

Relay Gold LANd



Relay Gold 4.0 adds support for mainframe graphics, new terminal emulations, and other extras designed to enhance PC-to-mainframe communications.

Strengthening its position as the communications package for big-system corporate environments, Microcom's *Relay Gold 4.0* adds support for mainframe graphics, new terminal emulations, and other extras designed to enhance PC-to-mainframe communications. Version 4.0 is also available in a LAN version, *Relay Gold LAN 4.0*, which can act as a gateway for up to 250 simultaneous LAN users.

The new *Relay* can display IBM 3279 graphics via Relay/3270 and IBM DFT-compatible coax boards. Support for the DFT (Distributed Function Terminal) protocol results in speedy, 32,000-bps transmissions and fast screen updates for micro-to-mainframe users. Graphics support also extends to videotex services, such as Minitel.

Other improvements to this communications heavyweight include support for expanded memory, additions to the powerful script language, and the addition of Tymnet78 and ANSI emulations. Version 4.0 costs $299, and *Relay Gold LAN* costs $825 for five simultaneous users. Microcom Software Division, 500 River Ridge Dr., Norwood, MA 02062-5028; 617/551-1000. —*Eric Brown*

Reader service no. 710

QEMM-386 5.0, QEMM 50/60 5.0, QRAM

No Wasted Space

With new versions of its memory management products, Quarterdeck Office Systems introduces enhancements to map the placement of programs in memory and provide suggestions on how to use memory more effectively.

Version 5.0 of *QEMM-386*, the Quarterdeck Expanded Memory Manager for 386-based systems, lets you load network drivers and buffers into high memory. Version 5.0 of *QEMM 50/60* has the same capability and also lets you use the extended memory of PS/2 Models 50 and 60 as EMS 4.0 expanded memory, so you can choose regions of memory into which to load TSRs. Also introduced is *QRAM (Quarterdeck Random Access Manager)*, which gives 8088-, 8086-, and 286-based computers the ability to load TSRs, mouse and other device drivers, and network drivers into memory between 640K and 1MB.

Bundled with all these is *Manifest*, a utility that displays a wide range of system parameters including interrupts, memory addresses, and available memory. *Manifest* also can monitor a *Desqview* session and can make recommendations on how to optimize an application's performance by reallocating memory via the CONFIG.SYS file.

Both *QEMM-386* and *QEMM 50/60* are $99.95. *QRAM* is $59.95. The three products don't require but are designed to be used with either the *Desqview 386* multitasking/windowing environment for 386 machines ($189.90) or *Desqview 2.2* for all other PCs ($129.95).

Quarterdeck Office Systems, 150 Pico Blvd., Santa Monica, CA 90405; 213/392-9851. —*Mike Hogan*

Reader service no. 715

Para-Mail 2.1

Get LAN E-Mail for Only 15K?

There's only one thing worse than RAM cram: LAN RAM cram. With the LAN operating system shell loaded, you're lucky if you can run an application, let alone toss in a couple of your favorite TSRs. Although most LAN E-mail users want to be able to send and receive messages from within applications, they usually can't. Popular LAN E-mail packages such as *cc:Mail* and *The Network Courier* let you do this, but they eat up 77K and 78K, respectively. You usually end up quitting your application and using the products in standalone mode.

Para-Mail 2.1, an electronic mail program for *NetWare 2.0a* or greater, may be the cure. Completely memory-resident so you can call it from within any application, *Para-Mail* uses only 15K. Despite its small RAM footprint, it manages to offer a full range of messaging features. In addition, you get a *WordStar*-like text editor, folders, priority levels, phone messages, and conversation tracking.

Using Novell's Message Handling Service (MHS), *Para-Mail* lets you swap mail with any other MHS-compatible LAN application. The price is $689 per 100 users. Paradox Development Corp., 7544 Trade St., San Diego, CA 92121; 619/586-0878. —*Eric Brown*

Reader service no. 711

The LASER 286/2 races through tasks at 6 or 12 MHz. Thirteen feature-packed configurations mean there's a 286/2 for every business or home use.

The LASER Turbo XT is switchable from 4.77 to 10 MHz. All nine configurations offer an impressive array of built-in features.

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Circle 150 on reader service card

Norton Commander 3.0

E-Mail Commander

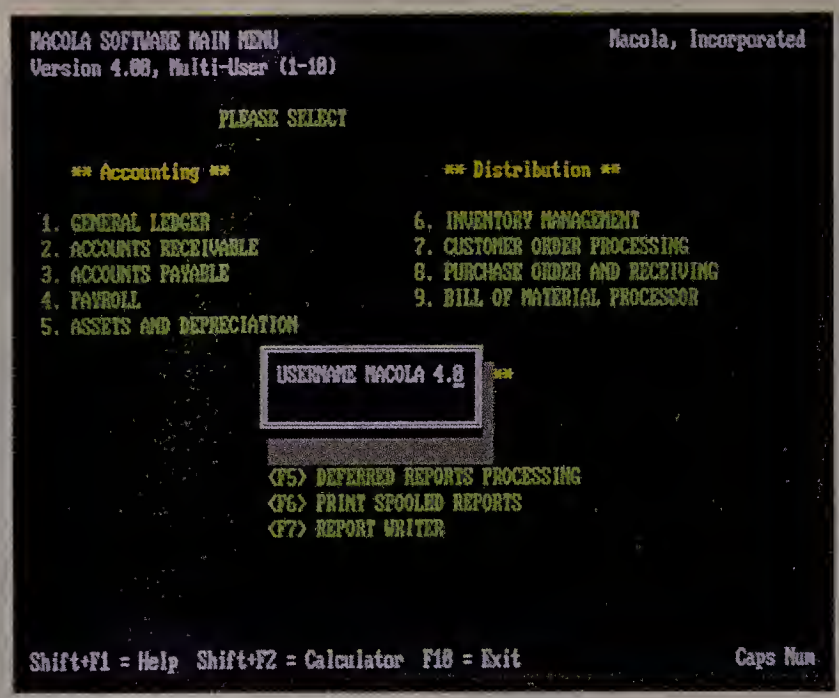
A new version of Peter Norton Computing's DOS shell enhances your ability to view files and provides an easy way to manage your MCI Mail traffic.

Norton Commander version 3.0 expands on its Quick View feature, letting you peek at the contents of files from 20 new applications in addition to *dBASE* and *1-2-3*. You still can see the contents of files on half the screen as you highlight them in your tree directory, which is displayed on the other half.

You can configure *Commander*'s display in several ways, and you can now set file attributes and search for files using common DOS filters. *Commander* unloads itself when you select a program and reloads when you exit an application.

Additionally, the 125K *Commander* now unloads when you select the new 90K Commander Mail module, which provides an easy way to manage MCI Mail in different folders and allows you to attach binary files as well as insert ASCII files into MCI Mail messages. The mail capability can be made memory resident.

Norton Commander, which retails for $149, requires 320K of memory and a hard drive. Peter Norton Computing, Inc., 100 Wilshire Blvd., 9th fl., Santa Monica, CA 90401-1104; 213/319-2000.
—*Mike Hogan*
Reader service no. 716



Macola Accounting Software 4.0 lets you generate reports anytime, whether you're in the office or not, and provides multiuser system enhancements such as manager-selected passwords.

Macola Accounting Software 4.0

More Shinola on Macola

With *Macola Accounting Software 4.0*, you don't have to be in the same office as your PC—in fact, you don't even have to be at work. The deferred-report-processing utility allows you to create a batch list of instructions to be executed at a specific time so that you can regularly post items or generate reports at night or on weekends.

Macola simplifies the upgrade from single-user to multiuser installations with improved documentation for its 13 modules and with a new module to lead novice networkers through installation and utilities. New context-sensitive help and a tutorial directory further assist those still feeling their way into networks.

For security, *Macola* offers system-manager–selected passwords. The ability to consolidate the accounts of up to 99 companies—previously an add-on feature—is now a general ledger standard.

Network support encompasses 3Com's *3+* and Novell's *NetWare* as well as IBM *PC LAN* or any other MS Net–based system. It requires DOS version 3.1 or later and 640K of memory. The prices of Macola's modules remain the same, ranging from $95 to $1595. Macola Inc., 333 E. Center St., Marion, OH 43301; 800/468-0834.
—*Mark Henricks*
Reader service no. 714

Tree86

Pruned-Down Hard Disk Manager

Among the healthiest products to grow up around DOS's disk-management shortcomings is *Tree86*. Many PC users prefer its intuitive structure, high-level search powers, and built-in mouse support to the vagaries of DOS commands for disk management.

The newest version of *Tree86* gives you all that and makes fewer demands on conventional memory —if you have extended or expanded memory or disk space available. Version 3.0 can temporarily store all but about 5K of command code and directory information in order to maximize the amount of conventional memory available to applications you launch from *Tree86*.

You can still tag files and move a whole group at once across directories. Instead of making you learn a new editor, *Tree86* lets you edit with your own word processor. You also get a full-featured file browser that can find, mark, and filter text files anywhere on your disk.

The non-memory-resident program requires 180K of memory—whether conventional or extended—and sells for $89.95. The Aldridge Co., 2500 CityWest Blvd. #575, Houston, TX 77042; 713/953-1940.
—*Mark Henricks*
Reader service no. 713

For more information about any product, contact the manufacturer or circle the number on the reader service card. ●

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Circle 3 on reader service card

Six SX Systems: A New Entry-Level Standard

For forward-thinking businesses, a system built around Intel's 386SX may be the smartest buy.

If the performance doesn't convince you, maybe the low price will.

TJ Byers

Windows/386, *Paradox/386*, *Foxbase+/386*, and a handful of others are scouts for an emerging army of 386-specific software. Developers can't resist exploiting the 386's 32-bit memory management and performance benefits, and now that the 486 has guaranteed compatibility with all 386-specific features, the march of shrink-wrapped 386 packages is on.

To take advantage of this next wave of software, all you need is a PC driven by a 386, a 486—or a 386SX. Available at 16 MHz only, SX machines cost about the same as 16-MHz 286 systems and considerably less than full-fledged 386s. An SX represents the most cost-effective way to capitalize on the forthcoming 32-bit version of OS/2, for instance, which reportedly will juggle multiple DOS, OS/2, and *Windows* programs while delivering much better performance than today's 16-bit OS/2. Businesses can ill afford to ignore such 32-bit functionality, which will make SXs, not 286s, the entry-level business machines of choice.

Think of the six SX systems reviewed here as baseline workstations for the nineties. The AST Premium Workstation/386SX, the Dell System 316, the Hewlett-Packard Vectra QS/16S, the IBM PS/2 Model 55 SX, the Tandon PAC 386sx, and the Tandy 4000 SX differ widely in performance—but none is fast enough to be a good file server or CAD workstation. That's why all the systems except the Dell System 316 offer a terminal-size footprint and less board and drive capacity than most bona fide 386s.

When it comes to memory, however, you'd better have room to grow. Although 4MB of RAM is enough to run OS/2 and one application, you need 8MB for anything resembling serious multitasking. All that RAM should reside either on the motherboard or in a special slot that can be accessed at CPU speed. If you have to put a memory card in the expansion bus to reach 8MB, you may cut system performance in half.

In the short term, you'll have to live with an SX system as a DOS machine, and that's where our performance tests turned up the biggest difference. The AST Premium Workstation/386SX turned in the fastest scores across the board, while the Tandon PAC 386sx lagged far behind on all but one test. In the OS/2 tests, the systems were much more closely grouped (except for the Tandon PAC 386sx, which currently can't run OS/2).

If the performance of these systems doesn't turn your head, some of their low prices will. As usual, to compare costs fairly, we've created a standard configuration that applies to each machine. It includes 2MB of RAM, one floppy drive, a 40MB hard disk, a VGA video board and color VGA monitor, at least one parallel and one serial port, a 101-key keyboard, and DOS 3.3.

AST Premium Workstation/386SX

The AST Premium Workstation/386SX is the fastest SX machine we've tested, thanks to a 32K memory cache that guarantees zero-wait-state operation. However, this mid-priced speedster ($4545 in the *PC World* configuration) has a severely limited expansion capacity, even for an entry-level workstation.

The attractive 4-inch-high cabinet has room for only two 8/16-bit boards, which you install horizontally, parallel to the motherboard. Furthermore, should you run across a full-height AT adapter (they're rare, but around), you'll discover the Premium accommodates XT-height cards only.

Dell's System 316 (far left) takes top honors due to its solid performance, very low price, free on-site service, and room for plenty of options.

STAN MUSILEK

FEATURES EVALUATION

Ready Right Out of the Box

The SXs reviewed here offer more built-in features—such as ports, video, and drive controllers—than most AT-size systems, enabling many of them to provide fewer expansion slots without giving up functionality.

● Yes
○ No
◒ Deficient

	AST Premium Workstation/386SX	Dell System 316	HP Vectra QS/16S	IBM PS/2 Model 55 SX	Tandon PAC 386sx	Tandy 4000 SX
Standard features						
Price[1]	$4545	$3499	$5929	$4610[2]	$4539	$4646
Clock speed (MHz)	16/8	16/8/6	16/8	16	16/8	16/8
Built into motherboard						
Parallel port	●	●	○[3]	●	●	●
Serial port	●[4]	●[4]	○[3]	●	●	●
Floppy disk controller	●	●	○	●	●	●
Mouse port	○	○	●[5]	●	○	○
Coprocessor support	387SX	387SX	387SX	387SX	387SX	387SX
Disk caching software	●	◒[6]	●	●	○	◒[5]
CPU-speed RAM						
Capacity	6MB	8MB	8MB	4MB	8MB	16MB
Expandability						
8/16-bit slots/number free	2/2	6/5	6/4	3/3[7]	4/3	5/4
8-bit slots/number free	0/0	2/2	1/1	0/0	1/0	0/0
Half/full-height bays	1/0[8]	5/2	3/1	2/0[8]	1/2[9]	4/1[10]
300MB or larger hard disk available from maker	○	●	○	○	○	○
Ergonomic design						
Switchless setup	○	●	○	●	○	○
Compact footprint	●	○	●	●	●	○
Complete documentation	●	●	●	●	●	●
Tilt-and-swivel base	●	●	●	●	●	○
Front-panel reset button	●	○	○	○	●	●
Front-panel on/off switch	○	○	●	●	●	●

[1] Price is based on the standard PC World configuration for 16-MHz systems, which includes 2MB RAM, 40MB hard disk, 1.2MB floppy drive, VGA board and color VGA monitor, one parallel and one serial port, 101-key keyboard, and DOS 3.3.
[2] Same as footnote 1, except with a 30MB hard disk.
[3] Located on floppy/hard disk controller.
[4] Two serial ports.
[5] Via the HP-HIL (Human Interface Link) connector.
[6] Included in the extra-cost enhanced DOS.
[7] 8/16-bit MCA slots.
[8] 3½-inch form factor.
[9] Uses removable Personal Data Pac hard disk drives.
[10] Two 5¼ inch and two 3½ inch (one holding floppy drive).

The integrated motherboard helps compensate for the slot shortage. One parallel and two serial ports, a floppy disk controller, and an IDE (Integrated Drive Electronics) hard disk interface are built in. In addition, a special VGA module uses its own proprietary interface, leaving the two slots open.

The Workstation/386SX can access only 6MB of RAM at CPU speed, so you may need to add memory to the expansion bus for OS/2 multitasking. However, the memory cache also serves the expansion bus, which should keep the slower bus speed from severely affecting memory access times. Six SIMM (single in-line memory module) sockets lie in three banks of two apiece, and you can mix 256K and 1MB SIMMs between banks for flexible memory upgrades.

The system can hold only two drives: one half-height 5¼ inch and one half-height 3½ inch. Worse, the 40MB drive reviewed is the only one available for the IDE interface; AST's 110MB IDE hard disk is a bit too tall to fit. AST says it's working on other options, but for now more storage means shopping for a midget drive and giving up a precious slot to the extra controller.

The Workstation/386SX came out on top in all but one speed test, and the small, good-looking cabinet is a stunner. However, a 40MB hard disk is barely enough, and two slots quickly get eaten by network boards, al-

EXECUTIVE SUMMARY

AST Premium Workstation/386SX

80386SX system

The AST Premium Workstation/386SX zips past every other system in the roundup. Unfortunately, a single available hard disk and room for just two expansion boards make it less desirable.

	POOR	FAIR	GOOD	EXCELLENT
CPU-speed RAM capacity			●	
Expandability	●			
Ergonomic design				●
Performance				●
Overall value			●	

Reader service no. 640

ternate video boards, or special controllers. AST needs to provide more storage options before this swift system can cut it as a workstation.

Dell System 316

The Dell System 316 is a gem. Its speed is second only to that of the AST Premium Workstation/386SX, it comes with a one-year on-site warranty, and it lists for a low $3499 in the *PC World* configuration. It also bucks the downsizing trend, offering ample room for growth courtesy of Dell's standard AT-size chassis.

The motherboard can handle a total of 8MB of CPU-speed RAM, the minimum for multitasking more than a couple of applications with OS/2. Like the Workstation/386SX, it lets you mix 256K and 1MB SIMMs between banks of sockets. You configure memory (or anything else, for that matter) using a utility—no switch setting is required.

The System 316 provides more expansion capacity than most single users will need, thanks to six 8/16-bit and two 8-bit slots. With a floppy disk controller, one parallel and two serial ports, and an IDE hard disk interface built into the motherbeard, the only occupied slot holds the video board, leaving seven slots free. Dell offers 40MB and 100MB IDE hard disks for the System 316, but with support for five half-height drives, mass storage options are extensive.

Thanks to the System 316's fast hard disk, only the Workstation/386SX can beat its performance. Though Dell's unit came in fifth in the processing-intensive *1-2-3* benchmark, it placed second in the disk-intensive *dBASE III Plus* test and second or first in the OS/2 tests.

Its size is a bit old-fashioned, but overall the System 316 is one heck of a deal. It offers speed, comfortable CPU-speed RAM capacity, an on-site warranty, and a rock-bottom price. (Because Dell sells through the mail, however, the only way to pay less than retail is to buy in volume.) This is the perfect SX for people who need room for expansion more than room on their desks.

The sleek AST Premium Workstation/386SX is about as fast as an SX can get. Unfortunately, the only current hard drive option limits storage to 40MB.

EXECUTIVE SUMMARY

Dell System 316

80386SX system

BEST BUY

With an amazingly low price, good performance, and a year of free on-site service, the Dell System 316 may be the SX buy of the year. The only drawbacks are a large footprint and a merely acceptable capacity for CPU-speed RAM.

	POOR	FAIR	GOOD	EXCELLENT
CPU-speed RAM capacity			●	
Expandability				●
Ergonomic design				●
Performance			●	
Overall value				●

Reader service no. 641

HP Vectra QS/16S

Hewlett-Packard isn't known for turning out the speediest systems. Fortunately, HP's Vectra QS/16S is an exception, offering DOS performance nearly equal to that of the second-place Dell System 316. And like other HP products, this small-footprint system is

STAN MUSILEK

NSTL TEST REPORT

AST's SX Is Fastest Performer Overall

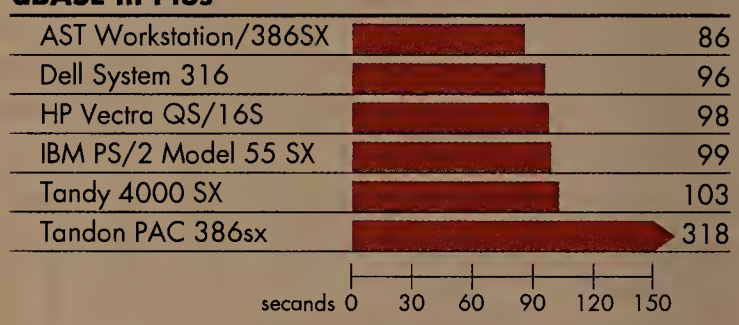
Thanks to memory caching, the AST Premium Workstation/386SX comes out on top in every DOS test and all but one of the OS/2 trials. Dell's second-place System 316 does a journeyman's duty with the help of its fast hard disk.

DOS

Microsoft Word

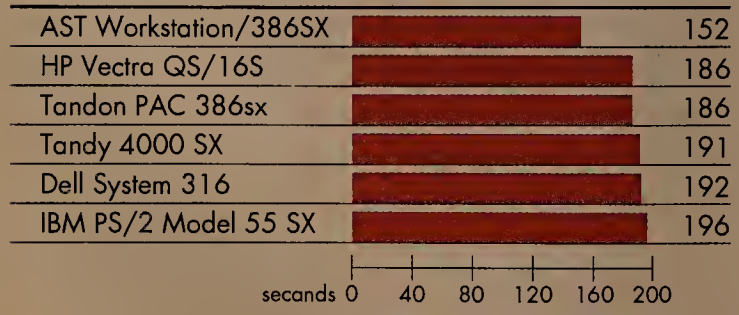
Microsoft C

dBASE III Plus



AutoCAD

1-2-3



Methodology
All machines were tested with o caprocessor and the monufocturer's own 256K extended-memory disk coche (except in the *1-2-3* benchmark). Each system was tested with 4MB of RAM except the AST, which was tested with 2MB, and the Tandy, which was tested with 5MB. Systems were canfigured with the fallawing sizes af hard disks: Tandan 30MB; AST, HP, ond Tondy 40MB; IBM 60MB; and Dell 150MB.

Microsoft Word 4.0
A *Microsaft Ward* macra laads a 35-page, 140-paragraph document and perfarms search-and-replace and spell-checking aperations. The first page af the document is then printed. Althaugh the results af the benchmark depend primarily an pracessar and memary access speeds, display adopter ond hord disk speeds are alsa cantributing factors.

dBASE III Plus 1.1
The *dBASE III Plus* test measures the time required ta prepare and print a repart of past-due invaices. The repart includes calculated fields and is based an three files: a 500-recard custamer file, o 1000-record invoice file, ond o 2000-recard item file. When disk caching is not used, the randam access speed of the hord disk is, after pracessor speed, the most significant factor in

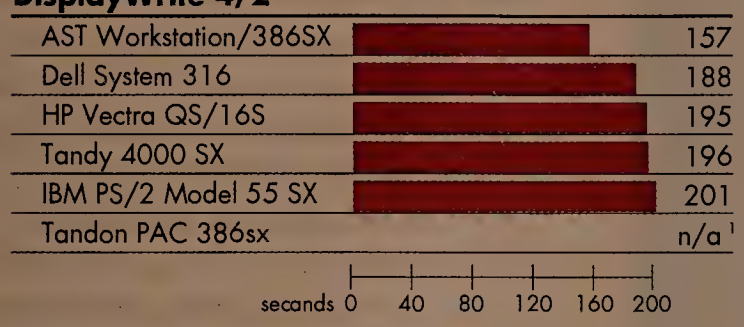
rock solid. But at $5929 in the *PC World* configuration, you'll need a piece of the rock to buy it.

In HP tradition, the system employs a removable processor board, raising the possibility of a painless brain transplant using a more powerful 386- or 486-based board. Along with the CPU, the processor board holds the coprocessor socket, all system RAM, and one parallel and one serial port. Only a few significant leftovers reside on the motherboard, including the system BIOS, expansion bus controller chips, and the HIL port (for HP devices only, such as touch screens, mice, and printers).

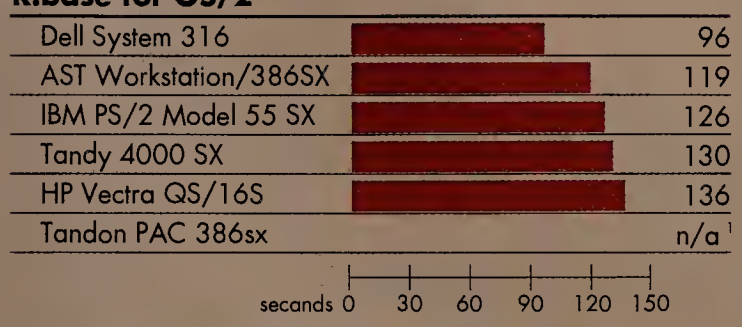
Like the Dell System 316, the QS/16S can access up to 8MB of CPU-speed RAM. You can upgrade in 1MB increments and mix 256K and 1MB SIMMs. Board accommoda-

OS/2 Single-Tasking

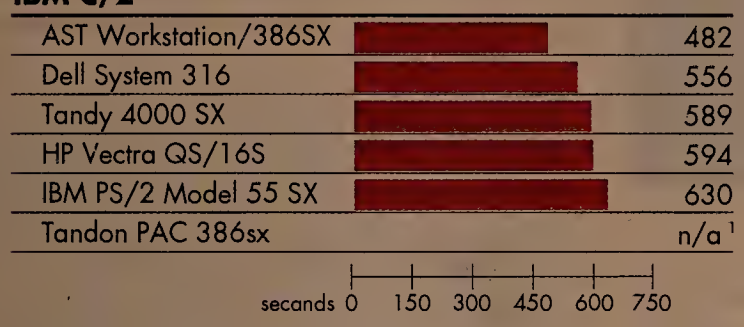
DisplayWrite 4/2



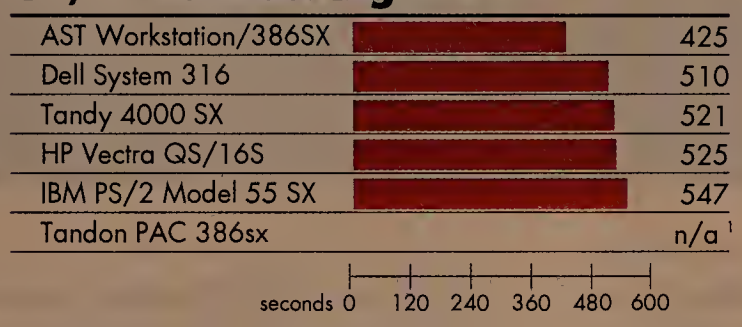
R:base for OS/2



IBM C/2



OS/2 Multitasking



[1] At test time, the Tandon PAC 386sx was unable to install OS/2 because of its hard disk configuration.

this benchmark. With disk caching, sequential read performance becomes more important than random access.

1-2-3 2.01
In this benchmark, a *1-2-3* macro executes a series of recalculations using five different formulas within a 75-by-75-cell matrix. Because there are few screen updates and no disk access is required, the results depend almost entirely on processing and memory access speeds.

Microsoft C 5.0
The *Microsoft C* benchmark measures the time required to compile and link *XLISP*. The most important factors in this benchmark are processor and memory access speeds. The performance of the hard disk is also a factor; generally, disk caching has little effect.

AutoCAD 9
In this benchmark, a three-dimensional sample drawing is retrieved and displayed using *AutoCAD*'s EGA driver. The zoom function is used to display the drawing from various perspectives; then the full drawing is printed. The results of the benchmark depend primarily on the speeds at which the processor and coprocessor operate and at which memory is accessed. The performance of the display adapter and the hard disk also have some effect.

DisplayWrite 4/2
Although the hard disk access rate plays a small part in this benchmark, processing and memory access speeds are the most significant factors. Memory architecture affects memory access speed: Systems that require additional memory in standard expansion slots to run OS/2 exhibit below-average performance.

While *DisplayWrite 4/2* is loading, the keystrokes to start a *DisplayWrite* macro are entered. The macro loads a 35-page, 140-paragraph document, replaces each occurrence of the word *today* with *tomorrow*, uses the built-in spelling checker to look for any incorrectly spelled words (there are none), paginates the document, prints the first page to an IBM Proprinter II, and exits *DisplayWrite*.

IBM C/2
In this benchmark, processing and hard disk sequential access speeds are the most important factors. The benchmark measures the time required to compile the 25 source code files that make up *XLISP*, a public-domain LISP interpreter.

R:base for OS/2
Processing and hard disk random access speeds are the most significant factors in this benchmark. Disk caching dramatically improves apparent disk access speed. This benchmark measures the time it takes to produce a report based on a three-file join, select, and sort.

OS/2 Multitasking
In two sessions, IBM's *C/2* compiles the 25 C source code files that make up *XLISP*. The results of this benchmark are determined by calculating the difference between the first session's starting time and the second session's ending time.

Data based on tests designed and conducted by National Software Testing Laboratories (NSTL). All rights reserved.

tions rate even better: Five slots, one 8-bit and four 8/16-bit, remain free after the disk controller and VGA boards are installed. And all three half-height bays are accessible from the front, leaving room for a floppy drive and a tape backup.

The Vectra QS/16S ran neck and neck with the Dell System 316 in the DOS tests and fell slightly behind in the OS/2 tests. The QS/16S was slightly faster with processor-intensive operations while the System 316 pulled ahead in the disk-intensive tests.

The QS/16S comes with a unique warranty that lets you choose between one year of carry-in or three months of on-site service. HP's software bundle is limited to a DOS shell, a disk caching utility, and an EMS 4.0 expanded memory emulator.

The Hewlett-Packard Vectra QS/16S offers good performance plus room for enough boards and drives to keep most people happy. But the price is high.

STAN MUSILEK

The Vectra QS/16S provides almost as much room for expansion boards as the Dell System 316, without hogging desk space. Moreover, it matches the latter's performance and CPU-speed RAM capacity. But with a $2430 difference in price, and less extensive free support, HP can't come near Dell's deal. HP's dealer discounts will take away some of the sting, but even so, you'd better have a *volume* discount to opt for the Vectra QS/16S.

EXECUTIVE SUMMARY

HP Vectra QS/16S

80386SX system

The Vectra QS/16S performed acceptably in the speed tests, and only the Dell System 316 has more room for drives and expansion boards. The very high price, however, keeps this system from taking second place.

	POOR	FAIR	GOOD	EXCELLENT
CPU-speed RAM capacity			●	
Expandability				●
Ergonomic design				●
Performance			●	
Overall value			●	

Reader service no. 642

IBM PS/2 Model 55 SX

At last IBM has released a PS/2 desktop at a midrange price—$4610 in the *PC World* configuration with a 30MB hard disk. One reason, if you believe the rumors, is that the Model 55 SX will soon be at the bottom of IBM's Micro Channel line. Unfortunately, limited expansion potential and disappointing performance place the Model 55 SX near the bottom of this roundup as well.

Only 4 inches high, the Model 55 SX boasts the same sleek cabinet as the PS/2 Model 30. As with AST's Premium Workstation/386SX, you install expansion boards horizontally, but the Model 55 SX does the Workstation/386SX one better by offering three 16-bit slots rather than two (it helps that Micro Channel slots are smaller).

The motherboard offers more built-in features than any of the others reviewed. You'll find VGA circuitry, a floppy and a hard disk controller, one parallel and one serial port, and a mouse port, leaving all three Micro Channel slots begging.

When it comes to drive and memory options, though, the Model 55 SX suffers. You can install only one 3½-inch floppy and one 3½-inch hard drive, and IBM limits the choice of hard disks to 30MB or 60MB. And

EXECUTIVE SUMMARY

IBM PS/2 Model 55 SX

80386SX system

It looks like the Model 55 SX may become IBM's entry-level Micro Channel machine. But the choice of drives ends at 60MB, and no other machine reviewed has such a low capacity for CPU-speed memory.

	POOR	FAIR	GOOD	EXCELLENT
CPU-speed RAM capacity	●			
Expandability		●		
Ergonomic design				●
Performance		●		
Overall value			●	

Reader service no. 643

with a 4MB ceiling on CPU-speed RAM, you can load maybe one Presentation Manager application before OS/2 starts swapping to disk, or before you get fed up and add RAM to the expansion bus.

The Model 55 SX demonstrated lackluster performance in the DOS tests and did only slightly better with OS/2. Superior disk caching resulted in some respectable individual scores (it ran with the pack on the disk-intensive *dBASE* test), but overall the system ranked second to last.

The usual amenities accompany the Model 55 SX. We'll say it again: No one can beat IBM's disk-based combination of tutorial, switchless setup routine, password protection, and automatic board configuration. The system also includes on-site service that costs only $25 for the first year.

With the Model 55 SX, IBM has lowered a major barrier to PS/2 acceptance—cost. IBM's proprietary RAM modules are also reasonably priced, and system discounts are deep. But with merely adequate performance, limited hard disk options, and the worst CPU-speed RAM capacity in the roundup, you trade too much for the IBM logo.

Tandon PAC 386sx

The price is average ($4539 in the *PC World* configuration), but the Tandon PAC 386sx, with its mini-tower, removable-drive design, is one of a kind. Too bad the performance is also unique—this system was the slowest tested by a wide margin.

The PAC 386sx mini-tower is designed to sit on your desk rather than under it. Two 3-by-5-inch cavities hold Tandon's removable hard disk drives (Personal Data Pacs), and a special interface on top of the machine accommodates a piggyback 1.2MB floppy drive. Personal Data Pacs come in 30MB and 40MB capacities.

Those familiar with removable storage know its advantages: You can transport large amounts of data between machines, lock the

IBM finally has an SX—but with room for only two drives. Other PS/2 Model 55 SX minuses include low CPU-speed RAM capacity and mediocre performance.

STAN MUSILEK

NSTL BENCHMARK TESTING

The exclusive test facility for *PC World*, **National Software Testing Laboratories (NSTL)**, is an independent organization that specializes in evaluating personal computer hardware and software. A recognized pioneer in state-of-the-art test design, **NSTL** believes that the most useful benchmark tests measure how well products perform when executing typical business tasks. **NSTL** testers follow detailed test plans that simulate normal operating conditions. A controlled testing methodology ensures objective, accurate, and consistent results and gives consumers a sound basis for making purchase decisions. **NSTL** publishes its test results in *Software Digest Ratings Report*® and *PC Digest*.™ Neither publication accepts advertising. **NSTL** is located in Philadelphia, Pennsylvania.

EXECUTIVE SUMMARY

Tandon PAC 386sx

80386SX system

Despite a removable hard disk and a rock-bottom price, we can't recommend the Tandon PC 386sx. The performance would embarrass a 12-MHz 286, and no compatible version of OS/2 is currently available.

	POOR	FAIR	GOOD	EXCELLENT
CPU-speed RAM capacity			●	
Expandability		●		
Ergonomic design				●
Performance	●			
Overall value	●			

Reader service no. 644

With the Tandon PAC 386sx, removable drives are part of the package—a boon for security. The problem is, the unit performs like an AT.

STAN MUSILEK

drive in a safe, and extend your system's storage painlessly. Installing a Personal Data Pac is just like dropping in a videocassette, but removing one requires that you key in a special code. The PAC 386sx comes with only the top receptacle activated; to activate the bottom one, you need to have your dealer install a $127 upgrade kit.

The Personal Data Pac's trade-offs lie in performance and compatibility. In the disk-intensive DOS tests, the PAC 386sx consistently placed dead last. Furthermore, although a Tandon version of OS/2 is in the works, the hardware disk cache renders the system incompatible with any existing version. In the meantime, you're supplied with *Windows/386;* the PAC 386sx is the only system to include it free.

The PAC 386sx houses a typical motherboard containing one 8-bit and four 8/16-bit slots, plus one parallel and one serial port. When you install a drive controller and a video board, three 8/16-bit slots remain free. The reasonable 8MB limit on CPU-speed RAM parallels that of the Dell System 316 and the HP Vectra QS/16S, but unlike those systems, the PAC 386sx won't let you mix 256K and 1MB SIMMs.

The PAC 386sx's price is right, and the removable-drive options could tempt security-minded users, but poor performance and lack of OS/2 support take this system out of the running. To make the PAC 386sx a serious contender, Tandon will have to soup up the removable drives and release its own version of OS/2.

Tandy 4000 SX

The Tandy 4000 SX's performance might not stop the show, but if you think you'll need lots of CPU-speed RAM for multitasking, this is the machine for you. Add a small chassis with plenty of room for boards and drives, and the system's moderate $4646 price (in the *PC World* configuration) makes it a solid deal.

The system supports up to 16MB of CPU-speed RAM, the maximum that the SX chip can address directly. Two memory boards hold 8MB each, and two special CPU-speed slots provide the accommodations. With some limitations, you can mix and match 1MB and 256K SIMMs among the eight sockets on each board; upgrading above 2MB proceeds from 5MB, to 8MB, to 12MB, to the system maximum.

In board capacity, the 4000 SX falls only slightly behind the HP Vectra QS/16S. You get five 8/16-bit slots, while the motherboard harbors one parallel and one serial port, a floppy disk controller, and an IDE hard disk interface—only the video board takes up a

EXECUTIVE SUMMARY

Tandy 4000 SX

80386SX system

The Tandy 4000 SX is the only machine in this roundup to support 16MB of CPU-speed RAM. There's enough room for boards and drives to keep most anyone happy, and the price is moderate, making this machine the second-best deal in the roundup.

	POOR	FAIR	GOOD	EXCELLENT
CPU-speed RAM capacity				●
Expandability			●	
Ergonomic design				●
Performance		●		
Overall value			●	

Reader service no. 645

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slot. And with room for two 3½-inch drives and two 5¼-inch drives, all of which are externally accessible, it's second only to the jumbo Dell System 316 in mass storage potential.

The 4000 SX performed acceptably in the OS/2 tests but fell slightly behind the middle of the pack in the DOS benchmarks.

While the other machines reviewed have ROM-based setup for memory configuration and the like, the 4000 SX couples awkward jumpers with disk-based setup utilities. Disk caching and EMS 4.0 emulation software come with Tandy DOS 3.3.

The 4000 SX is the second-best bargain in the roundup. It can't rival the Dell System 316's low price and top performance, but it beats the HP Vectra QS/16S's price by about $1300—all you sacrifice is marginally better performance. As the only system in the roundup that can hold a full 16MB of CPU-speed RAM, the 4000 SX will find special favor with those banking on OS/2 multitasking.

Tomorrow's Workstations Today

Frankly, we're getting a little tired of handing out Best Buys to Dell, but it looks like they've done it again. Although the Dell System 316 could do with a smaller footprint and more CPU-speed RAM, its combination of low price, good performance, and large expansion capacity is hard to beat—especially when you factor in Dell's excellent phone support and a year of free on-site service.

The second-place Tandy 4000 SX is one of two SX systems we've reviewed that can hold 16MB of CPU-speed RAM. The other is the Club AT 316SX, the hands-down winner of a previous roundup (see "The 32-Bit Question: 286 or 386SX?" September 1989). If you have multitasking in mind, the Club AT 316SX delivers a better deal than the 4000 SX, simply because it's faster and costs nearly $1500 less. However, with maximum RAM headroom plus a small footprint on the Club's side, and Dell's free on-site service and greater expansion capacity on the other, the choice between the two SX Best Buys is a toss-up.

Keep tabs on the AST Premium Workstation/386SX and the HP Vectra QS/16S. If AST can come up with a large hard disk for its speedy Workstation/386SX, or if Hewlett-Packard ever puts a big dent in the Vectra QS/16S's price, either system could move in on Best Buy territory.

A fair price, room for 16MB of CPU-speed RAM, and ample slots and drive bays make the Tandy 4000 SX a reasonable choice.

STAN MUSILEK

As our SX speed tests illustrate, performance at 16 MHz varies from system to system more than at 25 or 33 MHz. Moreover, the variations *mean* more to you: At 33 MHz a 20 percent difference in performance adds up to a fraction of a second in most operations, but at 16 MHz that same margin could mean the difference between continuing your train of thought and losing it while you wait for a spreadsheet to appear.

Conventional wisdom once maintained that 16-MHz performance wouldn't cut it for OS/2 application juggling. But high-performance software written for the 386 promises practical, low-cost, SX-based multitasking, provided your system has the zip and the memory to keep multiple applications humming. Thanks to the winning SXs reviewed here, everyone can afford a piece of the future. ●

TJ Byers is a contributing editor for PC World.

For more information about all products in this article, circle reader service no. 903.

WHERE TO BUY

AST Premium Workstation/386SX
AST Reseorch, Inc.
2121 Alton Ave.
Irvine, CA 92714
714/863-1333
LIST PRICE: Model 3 (1.44MB floppy drive) or Model 5 (1.2MB floppy drive) with 1MB RAM, one porollel ond two seriol ports, floppy/hord disk controller, 101-key keyboord, DOS 3.3, GW BASIC, disk coching, ond EMS 4.0 emulotion $2695; Model 45V with 40MB IDE hord disk, VGA grophics controller $3695
ACCESSORIES: 512K RAM $275, 2MB RAM $850; monochrome/CGA module $145, VGA module $300; monochrome VGA monitor $195, color VGA monitor $695; OS/2 $325
WARRANTY: one yeor ports ond lobor, corry-in
EXTENDED WARRANTY: none
TECHNICAL SUPPORT: toll number, M–F 8–5
OTHER SUPPORT: none
Reader service no. 640

Dell System 316
Dell Computer Corp.
9505 Arboretum Blvd.
Austin, TX 78759-7299
800/426-5150
LIST PRICE: with 1MB RAM, 40MB IDE hord disk, 1.2MB or 1.44MB floppy drive, one porollel ond two seriol ports, floppy/hord disk controller, monochrome boord ond monitor, 101-key keyboord, GW BASIC $2699; with 100MB IDE hord disk $3299
ACCESSORIES: 1MB RAM $200, 4MB RAM $1800; 1.2MB or 1.44MB floppy drive $130; 150MB IDE hord disk $800; VGA boord $300; VGA monochrome monitor $200, VGA color monitor $400; 80387SX moth coprocessor $400; DOS 3.3 $100, DOS 4.01 $120, OS/2 $299
WARRANTY: one yeor parts ond lobor, on-site
EXTENDED WARRANTY: up to five years on-site service ot obout 10 percent of purchose price per yeor
TECHNICAL SUPPORT: toll-free number, M–F 7–7
OTHER SUPPORT: BBS
Reader service no. 641

HP Vectra QS/16S
Hewlett-Pockord Business Computer Systems
19091 Pruneridge Ave.
Cupertino, CA 95014
800/752-0900
LIST PRICE: Model 10 with 1MB RAM, 1.2MB floppy drive, one porollel ond one serial port, 101-key keyboard $3295; Model 46 with 40MB hard disk, VGA boord $4395
ACCESSORIES: 1MB RAM $650, 2MB RAM $1295; 20MB hord disk $795, 108MB ESDI hord disk $2499, 152MB ESDI hord disk $3099; VGA monochrome monitor $349, VGA color monitor $749; 40MB streoming tope bockup $795; DOS 3.3 $135, OS/2 $325
WARRANTY: one yeor ports ond lobor, corry-in; or three months on-site
EXTENDED WARRANTY: through deoler
TECHNICAL SUPPORT: through deoler or $45 chorge per problem using toll-free number, M–F 7:30 o.m.–9 p.m.
OTHER SUPPORT: feebosed support pockoges
Reader service no. 642

IBM PS/2 Model 55 SX
IBM
900 King St.
Rye Brook, NY 10573
800/447-4700
LIST PRICE: with 2MB RAM, 30MB hord disk, 1.44MB floppy drive, one porollel ond one serial port, mouse port, floppy/hord disk controller, VGA controller, 101-key keyboord $3895; with 60MB hard disk $4295
ACCESSORIES: 2MB RAM $1395; 8MB MCA memory exponsion board with 2MB $1695; model 8503 VGA monochrome monitor $275, model 8512 VGA color monitor $595, model 8513 VGA color monitor $750; 80387SX moth coprocessor $795; 1.2MB externol floppy drive $335; DOS 3.3 $120, OS/2 $325
WARRANTY: one yeor parts ond lobor, on-site service $25 for the first year
EXTENDED WARRANTY: through deoler
TECHNICAL SUPPORT: through dealer
OTHER SUPPORT: none
Reader service no. 643

Tandon PAC 386sx
Tondon Corp.
301 Science Dr.
Moorpork, CA 93021
805/523-0340
LIST PRICE: with 1MB RAM, one octive hard disk receptocle, one seriol and one porollel port, DOS 3.3, GW BASIC, EMS 4.0, Windows/386 $2299
ACCESSORIES: 512K RAM $249, 2MB RAM $815; 30MB PAC hord disk $429, 40MB Personol Doto Poc hord disk $539; Personol Doto Poc receptocle octivation kit $127; 1.2MB floppy drive $203; VGA boord $363; VGA monochrome monitor $226, VGA color monitor $637
WARRANTY: one yeor parts and labor, carry-in
EXTENDED WARRANTY: through deoler
TECHNICAL SUPPORT: through dealer
OTHER SUPPORT: BBS
Reader service no. 644

Tandy 4000 SX
Tondy Corp.
1800 One Tandy Center
Fort Worth, TX 76102
817/390-3700
LIST PRICE: with 1MB RAM, 1.44MB floppy drive, one parollel ond one seriol port, floppy/hord disk controller, VGA boord, 101-key keyboard $2599
ACCESSORIES: 1MB RAM $649, 2MB RAM $1299; unpopuloted memory boord $100; VGA monochrome monitor $200, VGA color monitor $629; 40MB hord disk $649, 80MB IDE hord disk $899; 80387SX math coprocessor $580; DOS 3.3 $120, OS/2 1.0 $325
WARRANTY: one yeor ports ond lobor, corry-in
EXTENDED WARRANTY: one yeor through dealer
TECHNICAL SUPPORT: toll number, M–F 8–12, 1–5
OTHER SUPPORT: CompuServe BBS, Rodio Shock Computer Centers
Reader service no. 645

POWER TIP NO. 78

Hot Applications for ProComm

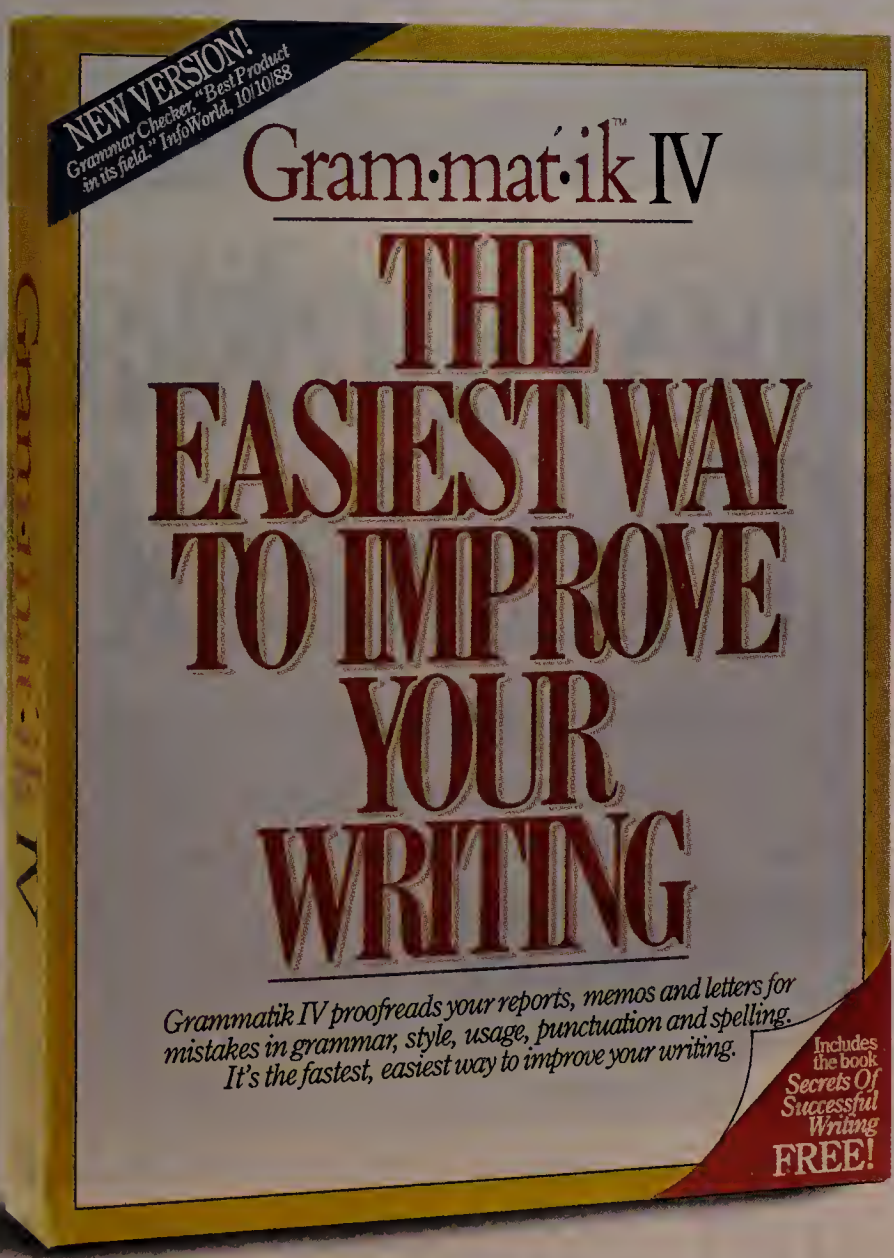
Sometimes you need to edit a file, find a phone number, use a calculator, or otherwise access another application during an on-line session. *ProComm Plus* has two hot-key combinations—<Alt>-J and <Alt>-U—that run external programs without exiting.

To program a hot key, press <Alt>-S to display the setup menu. Next, select File/Path Options, press <Enter>, and press F to set up <Alt>-J or G to set up <Alt>-U. Type in the application's drive path and file name and press <Enter>. Press <Esc> twice and then press <Enter> to save the assignment and return to terminal mode. Now, whenever you use the hot key, you start the application. Exit in the normal way, press <Enter>, and you're back in *ProComm*.

Phil James
Director of Technical Support
Datastorm Technologies

New & Improved

Cliché



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Circle 282 on reader service card

If they came back as Lotus 1-2-3, Freelance

As the Three Musketeers would say, "All for one and one for all."

The same guiding principle of teamwork is evident in how well Lotus® 1-2-3® works with Lotus Freelance® Plus 3.0 and Lotus Manuscript® 2.1 software programs.

When you need to bring 1-2-3 data and charts into truly outstanding business presentations, Freelance Plus is the best business graphics software for you.

While Lotus Manuscript word processing software gives you the best way to bring 1-2-3 data and charts into terrific-looking reports.

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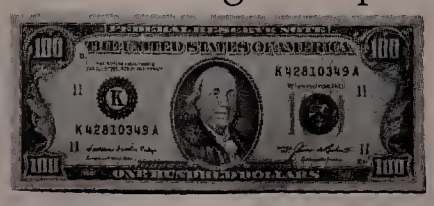

$100 "Perfect Fit" Rebate

For 1-2-3 Release 3 and 2.2 users who buy Freelance Plus or Manuscript.

Take Freelance Plus, for example. Recently, both *InfoWorld* and *PC Week* gave it the highest

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rating of all presentation graphics software.*

With Freelance Plus you have all the tools you need to plan, organize and prepare effective presentations. You can create everything from color slides to overheads to handouts. Or even on-screen presentations.

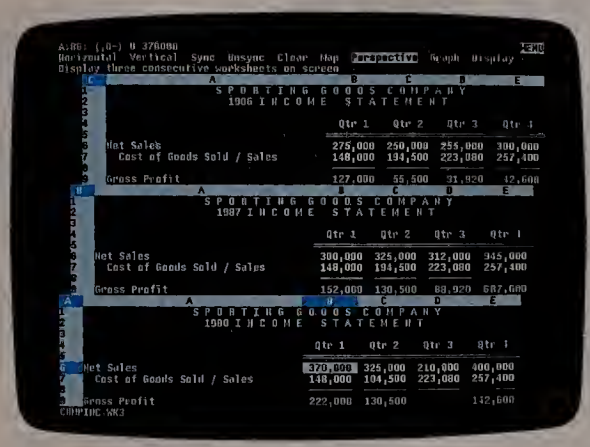
Only Freelance Plus provides a "live link" to 1-2-3. You can view your spreadsheet from within Freelance Plus and select ranges to chart using familiar 1-2-3 keystrokes. And when you retrieve a Freelance Plus chart file linked to 1-2-3, it will automatically reflect the latest data.

No other presentation graphics program gives you all this functionality and works more effectively with 1-2-3.

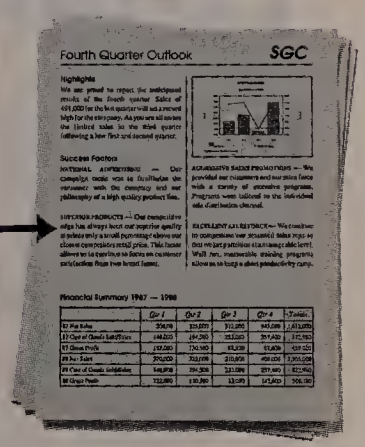
Manuscript's "live link" to 1-2-3 brings in the new numbers automatically. With no need to reformat your table.

No wonder Freelance Plus and Manuscript are called the "Perfect Fit" with 1-2-3.

Presentations



Spreadsheets



Reports

Lotus Freelance Plus and Manuscript are specifically designed to work well with 1-2-3.

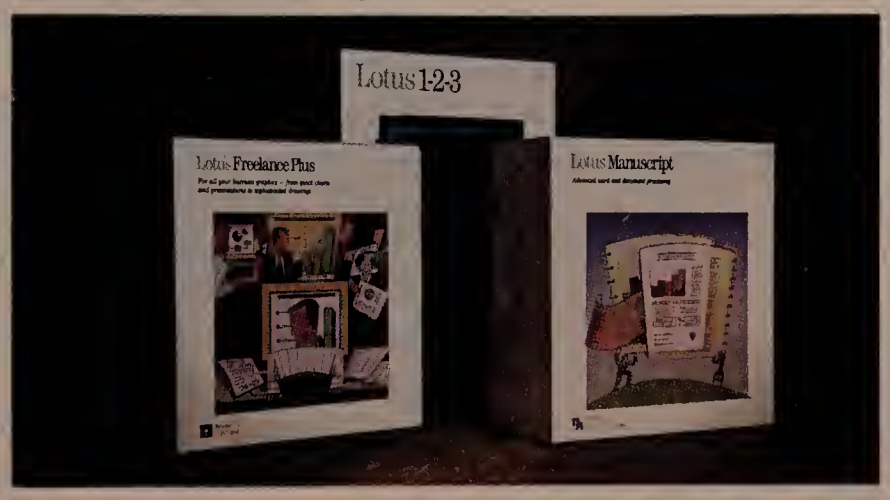
If you're a 1-2-3 Release 3 or 2.2 customer (including upgrades), Lotus will send you a $100 rebate for purchasing Freelance Plus or Manuscript between June 15 and December 31, 1989. Look inside your 1-2-3 package for a "Perfect Fit" Rebate Certificate and offer details.**

software, they'd be Plus, and Manuscript.

Then there's Manuscript. It's a full-featured word processor that gives you the best and easiest way possible to incorporate 1-2-3 spreadsheets and graphics into high quality reports.

You can import spreadsheet data—in table form—with columns and rows intact. Then easily enhance all your tables with borders and shading. And when your 1-2-3 data changes,

1-2-3 and Freelance Plus *or* 1-2-3 and Manuscript. Put one of the strongest teams in history to work for you.



Lotus Freelance Plus
Lotus Manuscript

if you purchase **both** Freelance Plus and Manuscript and send in both Proof of Purchase coupons and sales receipts.) To qualify, you must purchase the full retail version of Lotus Freelance Plus 3.0 (or 3.01) or Manuscript 2.1 from a purchases are not eligible. **InfoWorld*, April 3, 1989; *PC Week*, July 10, 1989. **For more information about the "Perfect Fit" program and how Freelance Plus and Manuscript work with the new Lotus 1-2-3, call 1-800-343-5414.

12-MHz ATs: Home-Office Alternatives

Who says you'll never buy another AT?

Our review of seven 286-based clones turns up some cost-effective computers for people who take their work home.

John Diebold

Work expands to fill available time—and then it expands beyond that. For managers who need to polish a report over the weekend or double-check overhead transparencies for tomorrow's 9 a.m. presentation, a second computer on a desk at home can be essential.

Requirements for home machines differ from those for heavy-duty office computers. Such industrial-strength systems may need a high-speed 80386 CPU for large spreadsheets, big data bases, desktop publishing, and so forth. But when your homework involves only an occasional light-duty project, top performance is less essential, and a lower price more than compensates for a slightly slower work-save.

Of course speed is still important. If you're accustomed to a full-powered system at work, you'll find a poky 8088 so slow at scrolling through large text files or recalculating spreadsheets that you might be tempted to avoid your homework altogether. Fortunately, many of today's 80286 systems are much faster than you might expect, and they're priced low enough that 8088s are simply not a meaningful option.

PC World has rounded up seven candidates for home stardom: American Mitac's MPC2000SL, AST's Bravo/286, Commodore's PC40-III, Dell's System 210, Epson's Equity II+, HeadStart Technologies' HeadStart III, and IBM's PS/2 Model 30 286.

Key Buying Issues

The most important issues to consider when buying a home system are price (you'll be paying for it yourself), phone support, and warranty (see the sidebar "Buying Smart: Service and Support," page 142). Since you won't be running heavy-duty, memory-intensive applications very often, 2MB of CPU-speed memory should be sufficient. (RAM mounted on a standard expansion board runs at a slower bus speed—usually 8 MHz—causing some performance degradation.) A minimum of three half-height drive bays is a reasonable expectation, as are three free slots (for, say, a modem, a bus mouse, and a memory board). Speed is a factor too, but not a big one.

Since you'll probably buy your home machine without a corporate quantity discount, you'll want to look at "street" prices offered by discount mail-order dealers like 47th Street Computer. To make that task easier,

we calculated a street price for each system by averaging quotes from three discount dealers. Street prices are quite volatile, however, and you should use those figures as a preliminary guideline only. In all cases, systems were priced as close as possible to the standard *PC World* configuration: 1MB of RAM, one floppy drive, one 20MB hard disk, a 101-key keyboard, DOS 3.3 or later, a VGA adapter, and a VGA color monitor. (We selected the VGA option because color helps you work better and longer, and VGA is now the cheapest color setup you can get.) All systems boasted switchless setup.

You won't be able to call the tech support department at your office if something goes wrong with your home system, so a "service and support" category has been added to the Features Evaluation; results are summarized in individual Executive Summaries. At least 12 months of warranty coverage is essential. On-site service and a toll-free tech support number are extremely desirable—so much so, in fact, that for a product to receive an "excellent" rating, both on-site service and toll-free support must be offered. Support lines should be open at least 10 hours a day to accommodate calls from either coast; weekend hours, while rare, are also very handy. Additional support, such as a BBS, makes it easier to get help at odd hours.

Buying an AT for home use is a situation where careful evaluation of the manufacturer as well as the product makes real sense. In the long run, the commitment of the company is just as important as the quality of the product in keeping you up and running.

American Mitac's MPC2000SL boasts four drive bays and a surprisingly low price, but service, support, and performance are unimpressive.

JOHN GREENLEIGH

EXECUTIVE SUMMARY

American Mitac MPC2000SL

80286 system

Street price is low, and you get four drive bays, but there's a low 1MB CPU-speed RAM ceiling, performance is unimpressive, and warranty and support could be a lot better.

	POOR	FAIR	GOOD	EXCELLENT
CPU-speed memory			●	
Expandability				●
Ergonomic design				●
Service and support				●
Performance			●	
Overall value			●	

Reader service no. 675

American Mitac MPC2000SL

With a pleasantly low street price ($2300 in the standard *PCW* configuration), American Mitac's 10-MHz MPC2000SL won't make much of a dent in your wallet. Unfortunately, if something breaks you'll have to mail the machine back to the factory; no on-site or carry-in option is available.

AST's Bravo/286 offers a lowball price, but its performance is poky, and you'll have to mail it back to the factory or dealer for service.

JOHN GREENLEIGH

The MPC2000's most outstanding feature is its four half-height device bays, three of which are externally accessible. That's the highest number in the roundup, and an impressive complement to such a small machine. You can install a hard drive, two floppies, and a tape drive if you wish.

In most other ways, the SL is unexciting. Since its integrated motherboard holds five expansion slots (one 8-bit, four 8/16-bit) as well as I/O ports, a floppy controller, and a graphics adapter, you'd expect at least four free slots. Unfortunately, the built-in graphics adapter is only CGA/Hercules compatible; once you add a VGA adapter and a hard disk controller, you're down to three. Furthermore, the SL will address only 1MB of CPU-speed RAM.

Although the SL's 80286 CPU is keyboard switchable between 10 and 8 MHz, even in high gear it's less than breathtaking; scores on National Software Testing Laboratories benchmarks tend toward the bottom of the chart.

Though its low price and good device capacity are pluses, the Mitac MPC2000SL falls short in most other areas. You can do better.

AST Bravo/286

If saving money is your primary passion, this inexpensive and unremarkable 8-MHz system may be just what you're looking for. Its street price not only ties for lowest in the roundup ($2090 in the standard *PCW* configuration), that price also buys you a 40MB hard drive. (AST sells a version with a 20MB hard drive for $200 less, but we were unable to get one for testing.) What's more, the Bravo addresses a generous 4MB of CPU-speed RAM.

Tech support and service are nothing to write home about. AST does provide a convenient 24-hour bulletin board for late-night and weekend access, but if you want phone support, you have only 7 hours each weekday in which to call, and you'll foot any long-distance charges. Additionally, unless you negotiate an optional on-site service agreement with your dealer, you'll have to lug a malfunctioning machine back to your dealer (or AST) for repairs.

Slot and drive capacity are merely average. The integrated motherboard holds four slots (one 8-bit, three 8/16-bit). Since I/O ports and the floppy/hard disk controller are built in, you'll end up with three open slots in the *PCW* configuration. The Bravo has room for one internal half-height 3½-inch

EXECUTIVE SUMMARY

AST Bravo/286

80286 system

This system ties for lowest street price, including a 40MB hard disk, and you can add up to 4MB of CPU-speed RAM. But warranty and phone support leave a lot to be desired—and this is one of the slowest machines we tested.

	POOR	FAIR	GOOD	EXCELLENT
CPU-speed memory				●
Expandability			●	
Ergonomic design			●	
Service and support			●	
Performance			●	
Overall value			●	

Reader service no. 676

FEATURES EVALUATION

Dell 210: Best On Balance

For work-at-home systems, critical features are price, phone support, and warranty. AST's Bravo/286 and Commodore's PC40-III tie for lowest street price–but Dell's System 210 provides the best balance of price, performance, and features, plus outstanding on-site service and phone support.

● Yes
○ No
◒ Deficient

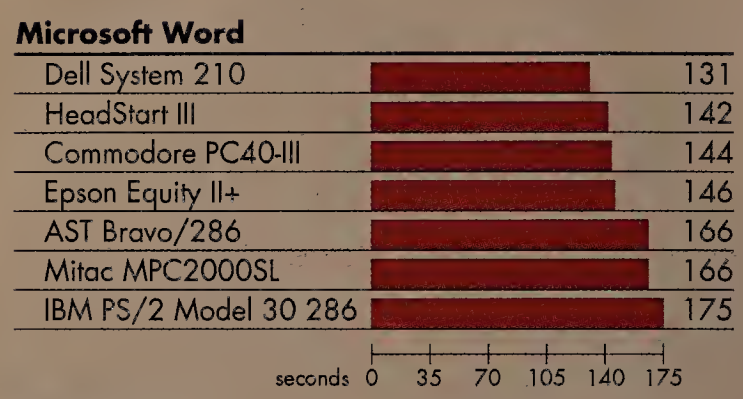
	American Mitac MPC2000SL	AST Bravo/286	Commodore PC40-III	Dell System 210	Epson Equity II+	HeadStart III	IBM PS/2 Model 30 286
Standard features							
Price [1]	$2707	$3505	$2995	$2199	$3597	$3399	$3433
Street price [2]	$2300	$2090	$2090	n/a	$2250	$2699	$2300
CPU speed (MHz)	10/8	8	12/8/6	12.5/6.25	12/8	12/8	10
Coprocessor support	80287-10	80287-8	80287-8	80287-6	80287-8	80287-8	80287-10
Disk caching software	○	●	○ [3]	● [4]	○	○ [3]	●
CPU-speed RAM							
Capacity	1MB	4MB	1MB	6MB	640K	3MB	4MB
Expandability							
8-bit expansion slots/number free	1/1	1/1	1/1	0/0	3/1	0/0	0/0
8/16-bit expansion slots/number free	4/2	3/2	3/3	3/3	3/1	6/4	3/3
Half-/full-height storage device bays	4/1	3/1	3/1	3/0	3/1	3/0	2/0
Ergonomic design							
Switchless setup	●	●	●	●	●	○	●
Compact footprint	●	●	●	●	●	●	●
Complete documentation	●	●	●	●	●	●	●
Tilt-and-swivel monitor	●	●	●	●	●	●	●
Front-panel reset button	●	○	○	●	●	●	○
Front-panel on/off switch	●	○	○	●	●	●	●
Service and support							
Warranty period (months)	12	12	12	12	12	18	12
On-site service	○	◒ [5]	○	●	○	●	◒ [6]
Toll-free support number	●	○	○	●	●	●	◒ [6]
Daily support (hours)	9	7	9	12	10	12	◒ [6]
Weekend support	○	○	○	○	○	○	◒ [6]
BBS	○	●	○	●	○	●	○

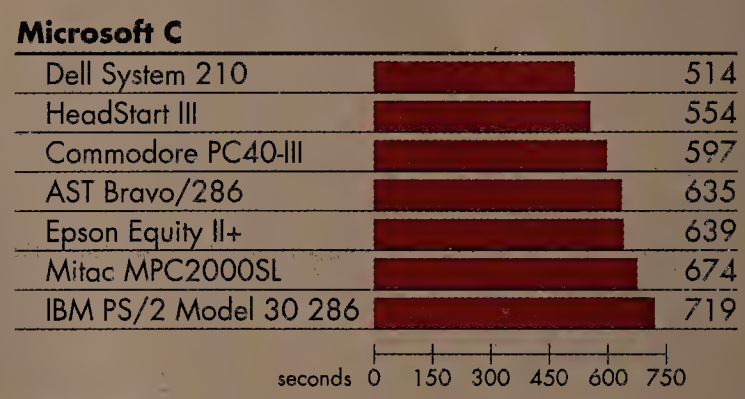
[1] Price is based on 1MB RAM, one floppy drive, one 20MB to 40MB hard drive, at least one parallel and one serial port, VGA adapter and VGA color monitor, 101-key keyboard, DOS 3.3 or later version.
[2] Street price based on average of prices from three discount dealers.
[3] Hardware disk cache included.
[4] Caching software included with DOS.
[5] Available at extra cost.
[6] May be available through dealer only; call dealer for details.

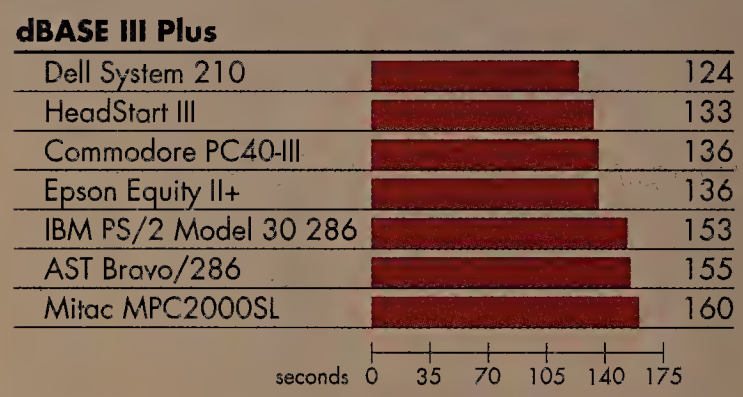
NSTL TEST REPORT

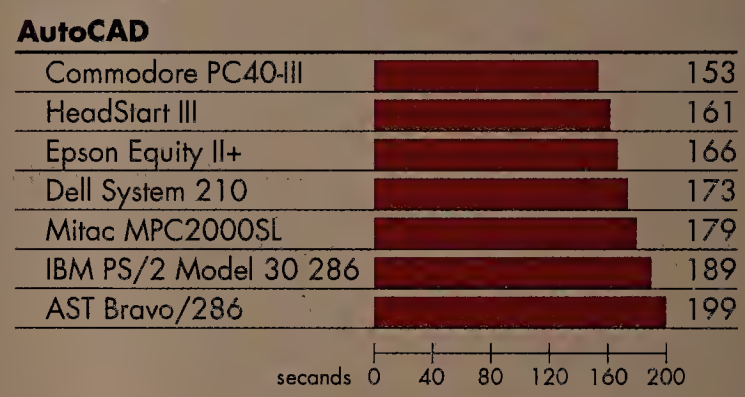
Dell 210: Top Performance Earns Best Buy

Dell's low-priced 12.5-MHz System 210 takes top spot in four out of five speed trials. More significant for home-AT buyers, it's also got the best service and support package.









Methodology
All machines were tested with 1MB of RAM, a coprocessor, and a 256K extended-memory disk cache (except in the 1-2-3 benchmark, which used no coprocessor or 256K disk cache). The AST ran at an 8-MHz clock speed; the American Mitac and IBM at 10 MHz; the Commodore, Epson, and HeadStart at 12 MHz; and the Dell at 12.5 MHz. All systems were tested with 40MB hard disks except for the IBM with 20MB, the HeadStart with 30MB, and the Dell with 105MB.

Microsoft Word 4.0
A *Microsoft Word* macro loads a 35-page, 140-paragraph document and performs search-and-replace and spell-checking operations. The first page of the document is then printed. Although the results of the benchmark depend primarily on processor and memory access speeds, display adapter and hard disk speeds are also contributing factors.

dBASE III Plus 1.1
The *dBASE III Plus* test measures the time required to prepare and print a report of past-due invoices. The report includes calculated fields and is based on three files: a 500-record customer file, a 1000-record invoice file, and a 2000-record item file. When disk caching is not used, the random access speed of the hard disk is, after processor speed, the most significant factor in this benchmark. With disk caching, sequential read performance becomes more important than random access.

1-2-3 2.01
In this benchmark, a *1-2-3* macro executes a series of recalculations using five different formulas within a 75-by-75-cell matrix. Because there are few screen updates and no disk access is required, the results depend almost entirely on processing and memory access speeds.

Microsoft C 5.0
The Microsoft C benchmark measures the time required to compile and link *XLISP*, a public-domain program composed of 25 C source code files. The most important factors in this benchmark are processor and memory access speeds. The performance of the hard disk is also a factor; generally, disk caching has little effect.

AutoCAD 9
In this benchmark, a three-dimensional sample drawing is retrieved and displayed using AutoCAD's EGA driver. The zoom function is used to display the drawing from various perspectives; then the full drawing is printed. The results of the benchmark depend primarily on the speeds at which the processor and coprocessor operate and at which memory is accessed. The performance of the display adapter and the hard disk also have some effect.

Data based on tests designed and conducted by National Software Testing Laboratories (NSTL). All rights reserved.

storage device and two externally accessible half-heights. For some reason, the review unit we got from AST had both hard and floppy drives mounted in the accessible bays, leaving the internal bay empty. Make sure the dealer puts *your* hard disk inside, where it belongs.

Thanks to its poky 8-MHz CPU, the Bravo scores among the slowest machines tested. AST has included disk caching software at no extra cost to speed things up, but it doesn't seem to help much. You also get diagnostics and a software setup utility.

The AST Bravo's low price is tempting, as are its 40MB hard disk and generous 4MB CPU-speed RAM capacity. But an inconvenient warranty policy, limited (and expensive) tech support, and relatively poor performance are major drawbacks. It's not a smart buy for home use.

Commodore PC40-III

In some respects the bargain-basement PC40-III is surprisingly similar to the AST Bravo. In fact, these machines tie for the lowest street price ($2090 in the *PCW* configuration), and both give you a 40MB hard drive.

EXECUTIVE SUMMARY

CommodorePC40-III

80286 system

This system ties for lowest street price, and you get a 40MB hard disk, four usable slots, and respectable performance. But you'll have to foot the charges for tech support calls, warranty service is mail- or carry-in only, and you're limited to 1MB of CPU-speed RAM.

	POOR	FAIR	GOOD	EXCELLENT
CPU-speed memory			●	
Expandability				●
Ergonomic design				●
Service and support			●	
Performance				●
Overall value				●

Reader service no. 677

Commodore PC40-III ties AST's Bravo for lowest price in the roundup—and it's faster. Support and service leave a lot to be desired, though.

The 12-MHz PC40-III is a bit faster than the 8-MHz Bravo, and Commodore throws in a few nice extras (a mouse and a 64K disk cache in hardware)—but don't look for much in the way of advice or service. Technical support is available only via a toll call during East Coast business hours, and if the unit flakes out you'll need to lug it in to one of Commodore's 1100 nationwide service centers; there's no on-site or extended warranty.

The PC40-III is limited to a stingy 1MB of CPU-speed RAM. However, thanks to a fully integrated motherboard, expansion board capacity is a bit better than average; you end up with four usable slots—one 8-bit and three 8/16-bit. Commodore also gives you three half-height bays, two of which are externally accessible.

The PC40-III's performance scores are respectable. It placed squarely in the middle of the pack, with a first-place finish in the *AutoCAD* benchmark.

The Commodore PC40-III comes in at a very low price with a largish 40MB drive, fairly good performance, and better-than-

JOHN GREENLEIGH

Dell System 210 is both fast and inexpensive —and you get Dell's justly famous on-site service package at no extra cost.

JOHN GREENLEIGH

average board capacity. However, its 1MB CPU-speed RAM ceiling is low, and tech support and service leave a lot to be desired. Unless a rock-bottom price is essential, you can do better.

EXECUTIVE SUMMARY

Dell System 210

80286 system

BEST BUY

Once again, Dell's low price, strong performance, and outstanding support and on-site service carry the day. And it holds up to 6MB of CPU-speed RAM.

	POOR	FAIR	GOOD	EXCELLENT
CPU-speed memory				●
Expandability			●	
Ergonomic design				●
Service and support				●
Performance				●
Overall value				●

Reader service no. 678

Dell System 210

There's no need to guess about the street price for Dell's new 12.5-MHz System 210—there *is* no street price. As always, this system is available only by mail order, direct from Dell. However, its low $2199 list price (in the *PCW* configuration) compares very favorably, and it includes Dell's outstanding service-and-support package.

Under Dell's one-year on-site warranty, if you're within 100 miles of a Xerox service center, or if you're willing to pay mileage, a technician will come to your home to service an ailing machine. Otherwise, you'll have to carry it in to the nearest Xerox center. Dell's toll-free technical support phones are manned a full 12 hours each weekday. And there's a 24-hour BBS.

The Dell 210 accommodates up to 6MB of CPU-speed RAM, but slot and device capacity are only average. The 210's integrated motherboard leaves you with three usable 8/16-bit expansion slots, and there are three half-height bays, two accessible from the front. Performance was excellent, thanks in part to the disk cache that comes with the DOS disk; the system placed first in four out of five benchmarks. (It slipped to fourth only in *AutoCAD*, probably because the slow 6-MHz coprocessor hobbled the CPU.)

The Dell System 210 is the smartest buy we know for your home desktop. Its price is only $109 higher than the lowest-end systems here, its service-and-support package is outstanding, its performance is excellent, and its 6MB capacity for CPU-speed RAM is very roomy. Go for it.

Epson Equity II+

Despite its low street price of $2250 (in the *PCW* configuration, with a 40MB hard drive), the 12-MHz Epson Equity II+ is something of a disappointment. It has the lowest CPU-speed RAM ceiling in the roundup (a measly 640K), and board capacity is below average. By the time you install boards for video, I/O, and a disk controller and a memory expansion board for the extra 384K of memory you'll need to reach the standard *PCW* configuration, you're down to

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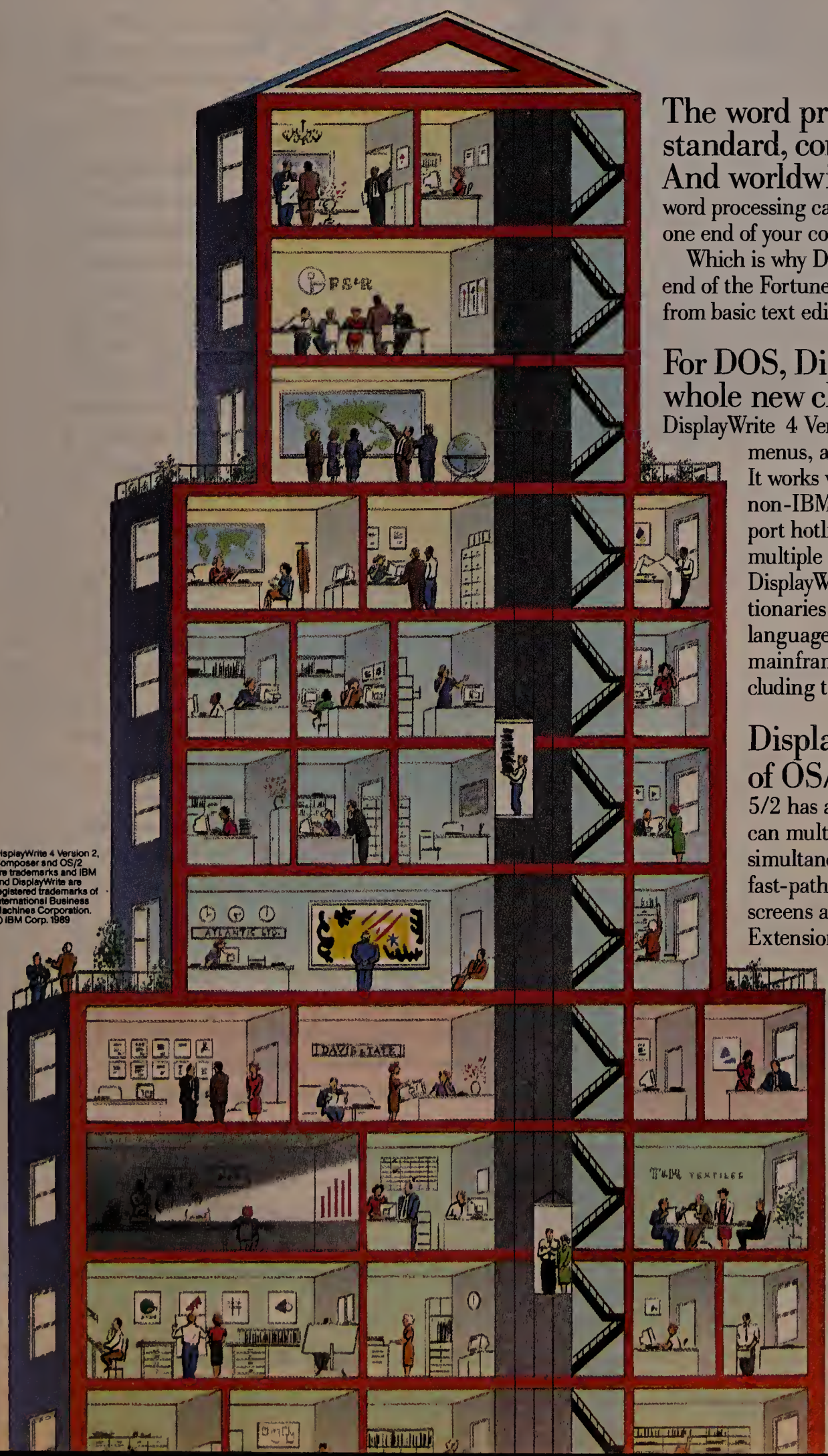

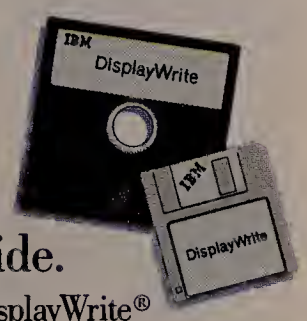

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Although Epson Equity II+ is attractively priced, its capacity for expansion boards and CPU-speed memory is seriously below average.

JOHN GREENLEIGH

only two open slots—one 8-bit and one 8/16-bit.

The Equity II+ does a bit better in the device department, with three bays for half-height devices, all externally accessible. The Equity II+ turned in midrank performance despite its relatively fast 12-MHz CPU.

Service and support are unremarkable.

EXECUTIVE SUMMARY

Epson Equity II+

80286 system

While the low street price is nice (especially with a 40MB hard drive), this system sticks you with unimpressive support and service—not to mention a cramped 640K limit on CPU-speed RAM and stingy slot capacity. Not a smart buy.

	POOR	FAIR	GOOD	EXCELLENT
CPU-speed memory	●			
Expandability		●		
Ergonomic design			●	
Service and support			●	
Performance			●	
Overall value		●		

Reader service no. 679

BUYING SMART: SERVICE AND SUPPORT

Working at home has its advantages: You can kick off your shoes, play the radio, and curse your boss for sticking you with an after-hours assignment. But if you run into a problem, you can't ask the computer whiz down the hall for help. You're at the mercy of the phone support and service agreement that come with your computer—and not all warranties are created equal.

Phone support probably counts for more than repair service because the vast majority of customer problems can be solved with advice. A toll-free support number is highly desirable, especially when you consider how long it can take to get through a congested call-waiting queue. And since you'll probably be doing your homework evenings or weekends, look for manufacturers who man tech support phones before or after hours. (There aren't many.) Failing that, a bulletin board service—run by the manufacturer or available through an on-line information service like CompuServe—provides another way to get answers at your convenience.

In the unlikely event that your computer needs a part replaced, on-site service is best. Some manufacturers offer on-site service free; others offer it only for a limited time, at extra charge, or not at all. And remember to read the fine print: Find out if there's a mileage limit for house calls made from a central service center and if technicians will make service visits evenings and/or weekends.

If you can't get on-site service, your next-best option is carry-in. Carry-in to the dealer is best, but you'll probably have to settle for carrying a sick system in to one of the large, nationwide chains like Xerox or Harris. The worst deal is mail-in, to either the manufacturer or a service center. Typically, you'll have to call for a return merchandise authorization (RMA) number, and you may be stuck with enormous shipping charges—not to mention the weeks you'll spend waiting. And shipping itself can cause damage.

How long a warranty period is long enough? Naturally, the longer the better—but since most computer hardware problems surface within the first few months, 4 months of on-site service can be much handier than 24 months of mail-in. —*J. D.*

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Circle 302 on reader service card

There's no on-site service; you'll need to carry a broken-down system in to an Epson dealer or to one of Epson's 1000 or so licensed service centers. Toll-free tech support is available 10 hours a day weekdays, but there is no BBS.

Aside from its reasonable price and its 40MB hard drive, Epson's Equity II+ has very little to offer. Smart 286 buyers can spend less money *and* get better value.

HeadStart III

Although the 12-MHz HeadStart III is relatively pricey ($2699 on the street), it's almost good enough to be a Best Buy. The company's base configuration includes two floppy drives (one 1.2MB and one 1.44MB), a 32MB hard drive, a cache controller with 64K of RAM, an enormous software bundle, and a Logitech mouse. Most important, the HeadStart comes with the best warranty in the roundup.

The 18-month limited warranty includes on-site service if you're within 100 miles of one of the 95 Harris service centers scattered around the United States. Telephone support is toll-free 12 hours a day on weekdays. HeadStart also offers support forums on CompuServe and GEnie.

The HeadStart's motherboard accommodates a comfortable 3MB of CPU-speed RAM, and it leaves you with four free 8/16-bit expansion slots (a better-than-average count) in the standard *PCW* configuration. A parallel port and two serial ports are built into the motherboard, and the drive controller card includes mouse and joystick ports. You get three half-height device bays, two of them externally accessible.

Thanks to the cache controller, the HeadStart's test scores were excellent. It placed second in every test except *1-2-3*, where it slipped to fourth.

Ease of use is HeadStart's trademark, thanks to a DOS shell that walks you through system setup and lists all the applications you've installed. And you get loads of software for free, including *FrameworkII*, *Publish-It*, *Xtree*, *Splash*, and *Chessmaster 2000*.

The HeadStart III is a tempting machine. It delivers an exemplary service-and-support package, an extra floppy drive, easy setup for computerphobes, and excellent performance. While $2699 is not a bargain-basement price—you pay for all that software—this system's extras make it the second best system in the roundup.

HeadStart III is a bit pricey, but it comes with both 1.2MB and 1.44MB floppy drives—and an excellent 18-month on-site warranty.

JOHN GREENLEIGH

EXECUTIVE SUMMARY

HeadStart III

80286 system

Two floppies, four usable slots, a 32MB hard drive, a Logitech mouse, and the best warranty in the roundup make this a very tempting system—despite its relatively high $2699 street price.

	POOR	FAIR	GOOD	EXCELLENT
CPU-speed memory			●	
Expandability			●	
Ergonomic design				●
Service and support				●
Performance			●	
Overall value				●

Reader service no. 680

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Tom Bigley & Glen Tapanila, InfoWorld, May 8, 1989

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IBM PS/2 Model 30 286

When is a PS/2 not a PS/2? When it's a 10-MHz Model 30 286—the first PS/2 from Big Blue to abandon the Micro Channel in favor of the good old AT bus. While the Model 30 286's street price ($2300 in the standard *PCW* configuration) is reasonable, and its integrated design makes the most of tight desk space, this machine doesn't represent good value, especially considering its sluggish performance and low device capacity. And though you're getting the IBM name, support and service are handled through your dealer—and *that* means you need to ask yourself whether the dealer with the best street price is going to be there for you when you have a problem. When all is said and done, you may end up spending a lot closer to list ($3433) in order to insure reliable support.

Nor is IBM's one-year warranty impressive. Tech support hours are limited to whatever your dealer provides—and unless you choose to pay extra for an on-site service contract, you'll have to mail or carry in a brain-dead Model 30 to get it repaired.

In any case, the machine itself is hardly a barn burner. If performance is a factor in your homework, you may find the Model 30 286 frustratingly slow; like the other 10-MHz system tested, it placed close to the bottom of the pack, despite IBM's free disk caching utility. And while the system addresses a comfortable 4MB of CPU-speed RAM, and the integrated motherboard lets you use all three 8/16-bit expansion slots for your own purposes, you're stuck with a 1.44MB floppy drive and IBM's 20MB hard drive; no other storage bays (and no other hard disks) are available.

If those three magic letters fill you with unspeakable joy, you may be satisfied with the PS/2 Model 30 286. But if you're looking for good performance and room to grow, you can do better.

IBM's PS/2 Model 30 286 is reasonably priced, but it's slow, and drive bays are few. Service and support are handled via local dealers.

JOHN GREENLEIGH

EXECUTIVE SUMMARY

IBM PS/2 Model 30 286

80286 system

It's small, reasonably priced, and made by IBM—but it's also stingy with device bays and distressingly slow, and service and support are available only through dealers. Not a great buy.

	POOR	FAIR	GOOD	EXCELLENT
CPU-speed memory				●
Expandability			●	
Ergonomic design				●
Service and support			●	
Performance			●	
Overall value			●	

Reader service no. 681

Plenty to Choose From

Competition for the home market is fierce—and a number of excellent systems are available. Even so, choosing *your* best buy means keeping priorities straight. If price, phone support, on-site service, and excellent performance are your primary needs, you can't beat the $2199 Dell System 210. If you're willing to spend a bit more ($2699 on the street), the HeadStart III offers the best warranty in the roundup—18 months of on-site service. You also get two floppies, a 32MB hard disk, and a generous software bundle.

The Industrial Revolution got workers out of their cottages and into factories and offices. Now the PC revolution seems to be sending many of us back to our cottages to complete the work we couldn't finish after a full day on the job—and we're spending our *own* money for the privilege. That thought alone should inspire you to cut your toughest deal on your next home box. Fortunately, as you can see, buying cheap need not mean settling for less than top value. ●

John Diebold is a marine geophysicist specializing in computer analysis of seismic data.

For more information about all products in this article, circle reader service no. 906.

WHERE TO BUY

American Mitac MPC2000SL
Americon Mitoc Corp.
410 E. Plumerio Dr.
Son Jose, CA 95134
408/432-1160
LIST PRICE: with 512K RAM, 1.2MB floppy drive, 1 seriol port, 1 porallel port, floppy disk controller, CGA adopter, DOS 3.3 $999
ACCESSORIES: 512K RAM $90; 1.44MB floppy drive $149; 20MB hord disk $325, 40MB hard disk $650; hord disk controller $69; VGA adopter $350; VGA color monitor $549; 80287-10 coprocessor $300
WARRANTY: one yeor limited, mail-in to monufocturer
EXTENDED WARRANTY: avoilable
TECHNICAL SUPPORT: toll-free number, M–F 8–5
OTHER SUPPORT: none
Reader service no. 675

AST Bravo/286
AST Reseorch Inc.
2121 Alton Ave.
Irvine, CA 92714
714/863-1333
LIST PRICE: with 512K RAM, 1.2MB floppy drive, 40MB hard drive, 1 serial port, 1 porallel port, floppy/hord disk controller $1995
ACCESSORIES: 512K RAM $275, 2MB RAM $850; VGA odopter $445; VGA color monitor $695; DOS 3.3 $95, OS/2 1.1 $325
WARRANTY: one yeor limited, moil-in (or corry-in to deolers); on-site service option ovailable through dealer
EXTENDED WARRANTY: avoiloble
TECHNICAL SUPPORT: toll number, M–F 8–3
OTHER SUPPORT: 24-hour BBS (toll coll)
Reader service no. 676

Commodore PC40-III
Commodore Business Mochines, Inc.
1200 Wilson Dr.
West Chester, PA 19380
215/436-4200
LIST PRICE: with 1MB RAM, 1.2MB floppy drive, 40MB hord drive, 1 seriol port, 1 porollel port, 1 mouse port, floppy/hard disk controller, VGA adopter, mouse, DOS 3.3 $2395
ACCESSORIES: 1.44MB floppy drive $199, 360K floppy drive $199; monochrome VGA monitor $249
WARRANTY: one yeor limited, moil- or carry-in to Commodore service center
EXTENDED WARRANTY: none
TECHNICAL SUPPORT: toll number, M–F 9–6
OTHER SUPPORT: none
Reader service no. 677

Dell System 210
Dell Computer Corp.
9505 Arboretum Blvd.
Austin, TX 78759-7299
800/426-5150,
800/274-3355,
512/338-4400
LIST PRICE: with 512K RAM, 1.2MB 5¼-inch or 1.44MB 3½-inch floppy drive, 1 parallel port, 2 seriol ports, floppy/hord disk controller, VGA adopter $1249; with 40MB tope unit $1649; basic configurotion with 2MB RAM $1849
ACCESSORIES: 512K RAM $100, 2MB RAM $800; 40ms 20MB hord drive $300, 29ms 40MB hard drive $500, 25ms 100MB hord drive $1100; 2400-bps modem $179; VGA color monitor $450; mouse ond PC Paint $109; DOS 3.3 $100
WARRANTY: one yeor, including free on-site service vio Xerox (within 100 miles of depot)
EXTENDED WARRANTY: ovailoble through Xerox
TECHNICAL SUPPORT: toll-free number, M–F 7–7
OTHER SUPPORT: 24-hour BBS, fox
Reader service no. 678

Epson Equity II+
Epson Americo, Inc.
2780 Lomito Blvd.
Torrance, CA 90505
800/922-8911,
800/421-5426,
213/539-5733
LIST PRICE: with 640K RAM, 1.2MB floppy drive, 40MB hord drive, 1 seriol port, 1 porallel port, floppy/hard disk controller, DOS 3.3 $2599
ACCESSORIES: VGA color monitor $599; 1.2MB floppy drive $299, 1.44MB floppy drive $219; 1200-bps internol modem $249; mouse $149; OS/2 1.0 $325
WARRANTY: one year limited, moil- or corry-in to dealer or locol center
EXTENDED WARRANTY: ovoiloble
TECHNICAL SUPPORT: toll-free number, M–F 7–5
OTHER SUPPORT: none
Reader service no. 679

HeadStart III
HeodStart Technologies
40 Cutter Mill Rd. #438
Greot Neck, NY 11021
516/482-4255
LIST PRICE: with 1MB RAM, 1.2MB and 1.44MB floppy drives, 32MB hord drive, 2 serial ports, 1 parollel port, 1 mouse port, floppy/hard disk controller, VGA odapter, Logitech mouse, DOS 3.3, softwore packoge $2699
ACCESSORIES: VGA color monitor $699, VGA monochrome monitor $249; 2400-bps modem $249; 3½-inch floppy drive $299
WARRANTY: 18 months limited, on-site within 100 miles of Harris center
EXTENDED WARRANTY: none
TECHNICAL SUPPORT: toll-free number, M–F 6–6
OTHER SUPPORT: GEnie BBS, CompuServe forum
Reader service no. 680

IBM PS/2 Model 30 286
IBM
900 King St.
Rye Brook, NY 19573
800/447-4700
LIST PRICE: with 512K RAM, 1.44MB 3½-inch floppy drive ond controller, 20MB hord drive, 1 seriol port, 1 porollel port, VGA odopter, DOS 4.0 $2595
ACCESSORIES: VGA monochrome monitor $275, VGA color monitor $623; 512K RAM $215, 2MB RAM $1295; 80287-10 coprocessor $595
WARRANTY: one year limited, carry- or moil-in; on-site service controcts ovailable through dealer
EXTENDED WARRANTY: ovoiloble through deoler
TECHNICAL SUPPORT: through deoler
OTHER SUPPORT: none
Reader service no. 681

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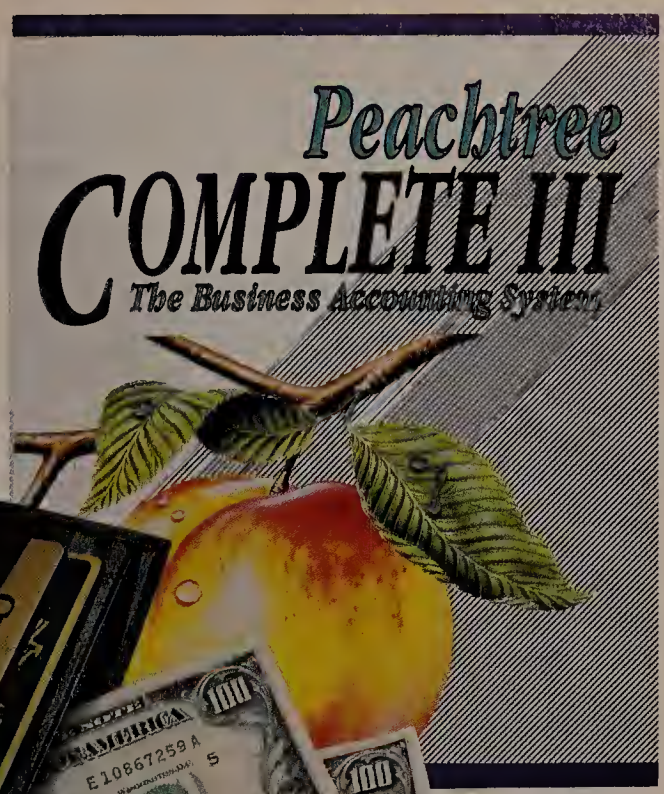

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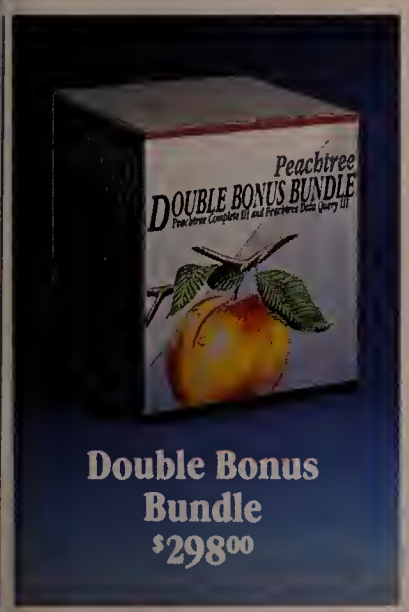

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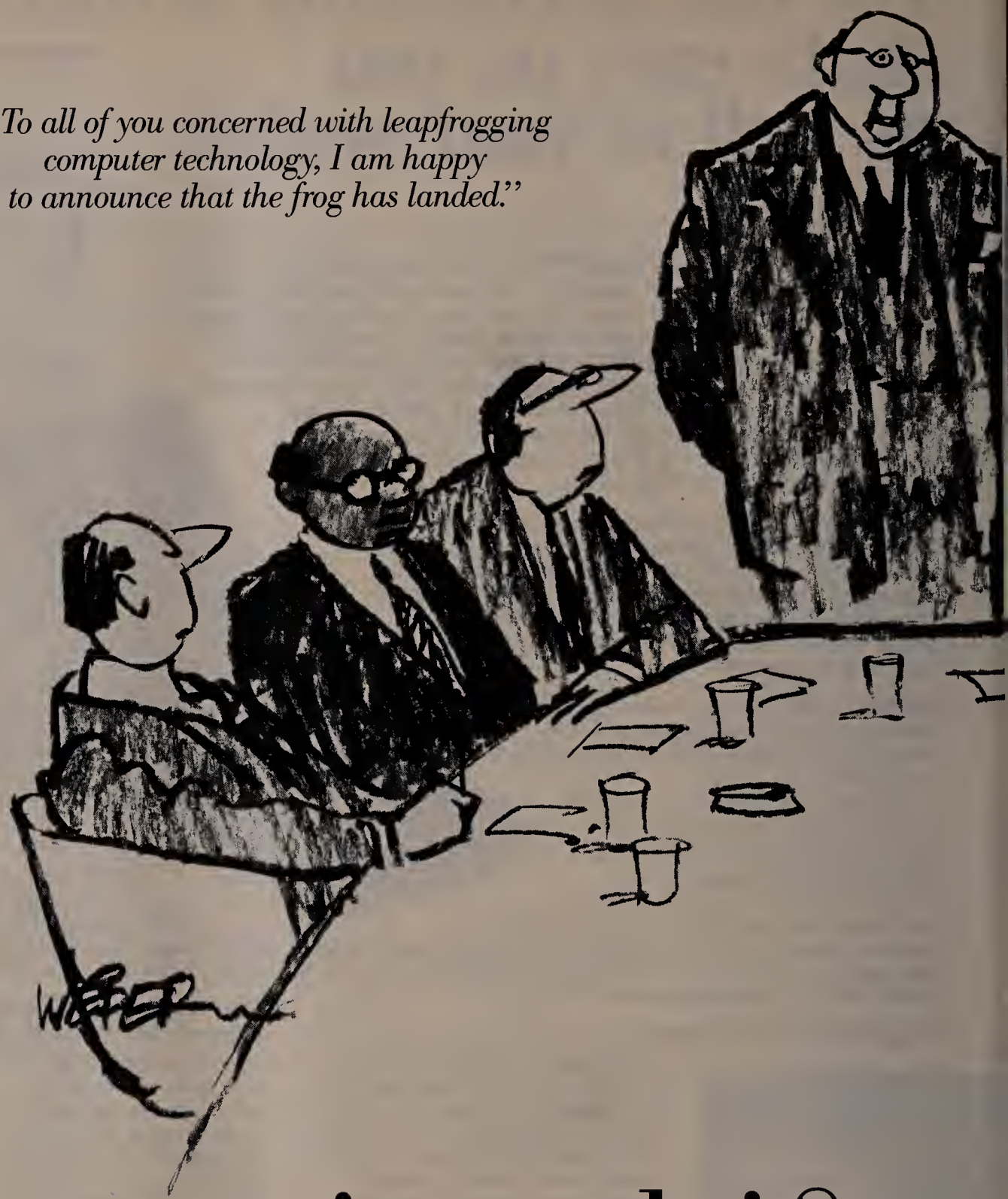

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LAN Storage: It Doesn't Come Easy

Is your LAN suffering from growing pains? An affordable 300MB hard drive can end your storage shortage.

But making it work with your server can be a king-size headache.

Robert Lauriston

Even small departmental networks can tax a server to the point of a nervous breakdown. Most companies turn to a 20-MHz or 25-MHz 80386 PC server for a speed boost—only to discover that the system's standard 40MB or 70MB hard disk can't handle the network's traffic and storage demands. Luckily, speedy 300MB-plus hard disks built around ESDI and SCSI controllers can be slipped into a 386-cum-server for about $4000; some drives cost as little as $2500.

PC World examined ten internal SCSI and ESDI drives from Core, Micropolis, Plus Development, Priam, and Storage Dimensions that fill the network bill. (Most are also suited for desktop publishers, CAD users, and others with megabytes to manipulate.) All offer 300MB or more of storage, and all are fast—although tests run by National Software Testing Laboratories (NSTL) pinpoint some significant differences.

Of course, there's more to these drives than size and speed. Nearly half are Novell certified, and the Core drive can be bought with *NetWare* preloaded. Storage Dimensions even offers *NetWare*- and DOS-specific versions of its drives, appropriately dubbed LANStor and SpeedStor. You can also add drives as your LAN expands: ESDI controllers can generally run two drives, while SCSI controllers can run up to seven daisy-chained units. All the drives come complete with controller, cables, *NetWare* drivers, and so on.

Installation, however, is anything but simple. Although each drive bypasses *NetWare*'s time-consuming COMPSURF disk-formatting routine, if a drive conflicts with the system's BIOS, an existing controller, a network adapter, or some other board, configuring it can be nearly impossible. Unless you enjoy dealing with multiple hardware conflicts, incomplete manuals, indifferent company support, and a hundred other irritating variables, leave installation and configuration to a dealer. It's money well spent.

Before You Buy

With drives costing thousands and hardware incompatibilities a real possibility, potential buyers should insist on a generous warranty along with acceptable price, performance, expandability, software compatibility, and superior company support. Here's what you get:

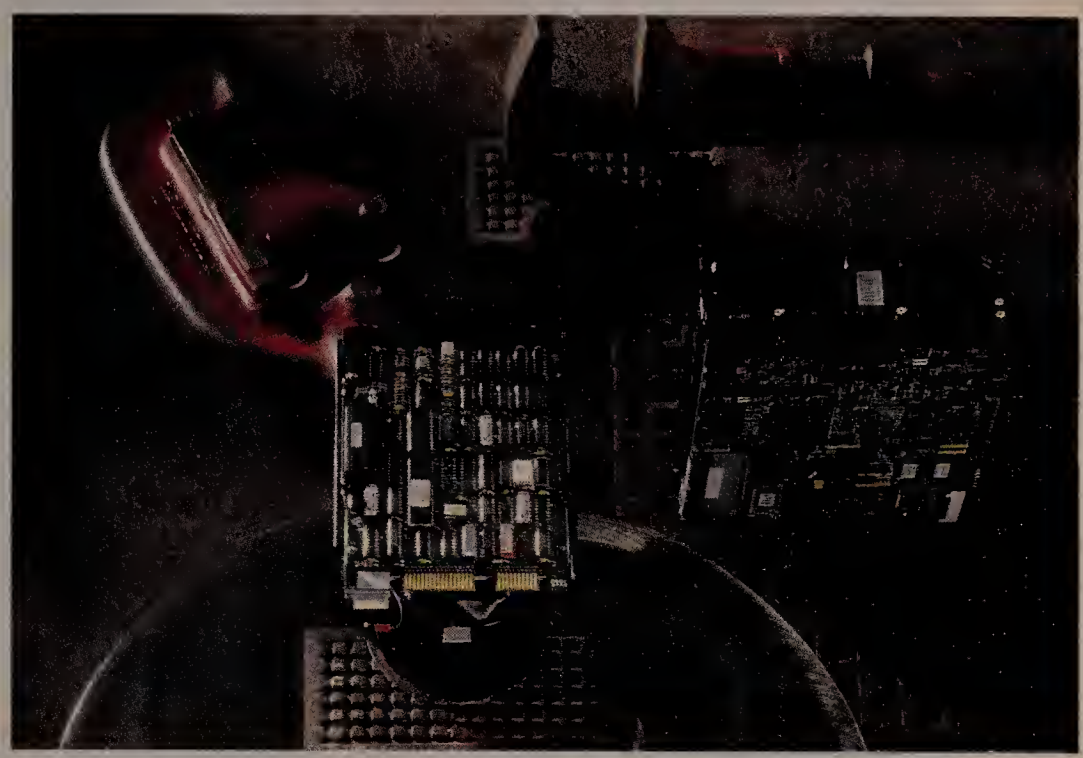
Warranty Most of the drive vendors offer a one-year warranty—which may not be enough given the pounding a server's hard

disk takes. Only the Priam and Core drives come with three-year warranties, a factor that tips the scales in their favor. Since all the drives reviewed here are finicky about other hardware, a money-back guarantee is a big plus—something that only Micropolis offers.

Price Drive costs range from $2495 (Micropolis) to $5490 (Core). But the key factor is cost per megabyte stored. The Priam Innerspace 330-E and the Storage Dimensions LANStor LAN335E offer comparable storage—but the Priam drive stores a megabyte for $1.67 less and is backed by a better warranty.

Performance Except for the Micropolis 1578, all the tested drives are speedy and will serve most LANs adequately. But you won't find one drive that's tops for both *NetWare* and DOS users. If *NetWare* performance is your only buying criterion—and if you don't mind the glitches—the Storage Dimensions LANStor LAN335E is clearly your choice. Those willing to live with a little less (and gain a fat warranty and top performance with non-Novell networks and DOS applications) will find the Priam Innerspace 330-E a better value.

Expandability Three hundred megabytes may seem like a lot, but if your LAN uses a fault-tolerance scheme, the ability to add drives can be crucial. Duplexing or mirroring drives with *NetWare SFT* halves usable disk space, and doing both (the usual approach) cuts it by 75 percent. Thus 1GB of total server storage could translate into only 256MB for networked users. Unfortunately, in some cases you're limited to two drives, for total storage just topping 600MB. (You can, of course, boost storage even more by attaching a company's higher-capacity drive.) The LANStor LAN320S and Core drives, however, can be daisy-chained for 4GB and 2.1GB of storage, respectively. Just remember that *NetWare/386*'s limit per server is 2.2GB—but that *NetWare/386* can easily



PAUL FRANZ-MOORE

manage terabytes of data. Note too that, contrary to vendor claims, SCSI and ESDI controllers aren't standardized, and you may be restricted to adding drives and controllers from the same manufacturer (see the sidebar "The SCSI-Versus-ESDI Standoff").

Software Compatibility *NetWare* and DOS compatibility are obviously crucial, but they're not givens. Novell certification is a plus, since certified units are compatible with *NetWare 2.1*x (regular, ELS, and SFT) and can be COMPSURF'd without any problems. DOS compatibility is more than a nicety, yet we found that the Micropolis drives couldn't create bootable partitions exceeding 32MB with Compaq DOS 3.31; with DOS 4.0, drivers may be required.

Company Support If a dealer installs one of these jumbo drives, vendor support isn't that vital. If *you* are installing it, it's a top priority. (Either way, you're going to pay for it.) Installation can take days or even weeks. Myriad jumpers and DIP switches have to be set, hardware conflicts are numerous and hard to pin down, and most drives come with confusing, out-of-date manuals. Unfortunately, we found that vendor technical support was often inadequate or just plain sloppy. If you install a drive yourself, be prepared for some unpleasant experiences.

FEATURES EVALUATION

Jumbo Hard Disks: The Warranty's the Thing

Turning your PC into a fast network server with one of these 300MB hard drives is a lot cheaper than it used to be, but it isn't necessarily easier. Look for compatibility, lengthy warranties, and low cost per megabyte stored.

● Yes
○ No
◒ Deficient

	Core HC AT-380	Micropolis 1558 PC/PAK	Micropolis 1578 PC/PAK	Plus Impulse	Priam Innerspace 330-E	Priam Innerspace 330-S	Storage Dimensions LANStor LAN320S	Storage Dimensions LANStor LAN335E	Storage Dimensions SpeedStor AT320S	Storage Dimensions SpeedStor AT335E
Capacity/expandability										
Price [1]	$5490	$2495	$2495	$5370 [2]	$3630	$3630	$4100	$4150	$3980	$4025
Formatted capacity—DOS [3]	371MB	321MB	320MB	320MB	322MB	320MB	n/a	n/a	319MB	331MB
Cost per megabyte stored—DOS	$14.80	$7.77	$7.80	$16.78	$11.27	$11.34	n/a	n/a	$12.48	$12.16
Formatted capacity—NetWare [4]	360MB	312MB	311MB	312MB	312MB	311MB	309MB	312MB	n/a	n/a
Cost per megabyte stored—NetWare	$15.25	$8.00	$8.02	$17.21	$11.63	$11.67	$13.27	$13.30	n/a	n/a
Smallest DOS volume [5]	277K	270K	270K	84K	276K	276K	n/a	n/a	130K	130K
Largest DOS volume	371MB	321MB	320MB	80MB	321MB	320MB	n/a	n/a	319MB	331MB
Bootable DOS partitions exceeding 32MB	●	◒[6]	○	●	●	●	n/a	n/a	●	●
Maximum number of DOS volumes	24	16	16	24	24	24	n/a	n/a	24	24
Controller/adapter	ESDI	ESDI	SCSI	proprietary	ESDI	SCSI	SCSI	ESDI	SCSI	ESDI
Maximum per server	3	1	1	2	1	2[7]	4	1	1	1
Maximum drives per controller	2	2	6	8	2	2	7	2	7	2
Runs floppy drive	●	●	○	○	●	○	◒[8]	●	●	●
Runs other devices	●[9]	○	●[10]	○	○	○	○	○	●[11]	○
Works with AT controller	●	○	●	●	○	●	●	○	●	○
Setup and installation										
Requires low-level format	○	●	●	○	○	○	●	●	●	●
Defect map included	●	●	●	n/a	●	●	●	●	●	●
FDISK compatible	●	○	○	○	●	●	n/a	n/a	○	○
Novell certified	●	◒[12]	○	●	●	○	◒[13]	●	n/a	n/a
Factory COMPSURF'd	●	○	○	●	●	●	●	●	n/a	n/a
Shipped with NetWare installed	●[14]	○	○	○	○	○	○	○	n/a	n/a
Compatibility										
DOS 3.3	●	●	●	●	●	●	n/a	n/a	●	●
DOS 3.31	●	◒[15]	◒[15]	●	●	●	n/a	n/a	◒[15]	◒[15]
DOS 4.0	●	●	◒[15]	●	●	●	n/a	n/a	◒[15]	◒[15]
SCO Xenix	●	●	●	○	●	●	n/a	n/a	○	●
NetWare 2.0a	●	●	○	○	◒[16]	◒[16]	○	○	n/a	n/a
NetWare/286 2.1*x*	●	●	●	●	●	●	●	●	n/a	n/a
Warranty										
Number of years	3	1	1	1	3	3	1	1	1	1
Money-back guarantee	○	●	●	○	○	○	○	○	○	○

[1] Including controller.
[2] With four 80MB drives and two controllers.
[3] Using Compaq DOS 3.31.
[4] Using Advanced NetWare/286 2.15 SFT.
[5] Smallest MS-DOS partition is one disk cylinder; PC-DOS is eight cylinders.
[6] Only with PC-DOS 4.0 or later version; Priam drives can use PC-DOS 3.0–3.3 if patched.
[7] Configuration software can support only two drives.
[8] Using SDC-800 board only.
[9] Runs 240MB tape drive and ANSI-compatible ESDI drives.
[10] Runs third-party tape, WORM, and CD ROM drives.
[11] Limited to Storage Dimensions WORM and erasable-optical drives.
[12] Not certified with the WD1007A-WA2 controller tested.
[13] Only with Maxstor drive and Future Domain adapter.
[14] $2500 for Advanced NetWare/286 2.15, $4200 for 2.15 SFT.
[15] Partitions larger than 32MB require special driver.
[16] Requires Novell DCB board.

Core HC AT-380

At $5490, the Core HC AT-380 is the priciest drive of the bunch. It's Novell certified, and you can get it with *NetWare 2.15* installed for a reasonable $2500 extra. Plug in three ESDI controllers and enough drives and you can create a 2.1GB server. But top price doesn't mean top performance: The AT-380 was merely average in all our tests. Core's three-year warranty is a plus, but the Priam Innerspace 330-E matches that, costs almost $2000 less, and performs better. The Core is simply outgunned.

Since the drive is low-level formatted and COMPSURF'd at the factory, installing DOS or *NetWare* is relatively straightforward. And if your version of DOS doesn't recognize partitions greater than 32MB, Core's Gigafile program will create nonbooting partitions of any size that even span multiple drives.

The AT-380 isn't the slowest drive or the hardest to set up. But better deals can be had.

EXECUTIVE SUMMARY

Core HC AT-380

Hard disk

The AT-380's expandability, Novell certification, and three-year warranty are attractive, but the price per megabyte stored is far too high, and performance is only middling.

	POOR	FAIR	GOOD	EXCELLENT
Capacity/expandability				●
Setup and installation			●	
Compatibility				●
Warranty				●
Performance (NetWare)		●		
Performance (DOS)			●	
Overall value			●	

Reader service no. 665

Micropolis 1558 PC/PAK

At just $2495, Micropolis's 1558 ESDI drive is the cheapest unit in the roundup. Performance under *NetWare* is inconsistent; under

THE SCSI-VERSUS-ESDI STANDOFF

The original ST-506 AT hard disk controller, with its 5-megabit-per-second (mbps) data transfer rate, can't keep up with today's faster drives, CPUs, RAM, and peripherals. Two systems that can are ESDI (enhanced small device interface) and SCSI (small computer systems interface) controllers.

ESDI, which has IBM's and Compaq's seal of approval, is essentially a souped-up ST-506 disk controller that offers 10- to 15-mbps throughput. All the ESDI boards reviewed can run two hard disks, and the Core lets you install up to three controllers in one PC. Since IBM has set a standard, you may be able to mix and match ESDI drives and controllers from various manufacturers.

A SCSI board is not really a controller but rather a high-speed (10 to 17 mbps), general-purpose communications device, similar to an Ethernet board. (Each SCSI drive has its own built-in controller.) The original idea was that SCSI would link not just hard disks but all devices that transfer data in bulk—laser printers, scanners, fax machines, and so on. While most SCSI devices on the PC market are hard disks, there are a few SCSI tape, WORM, erasable optical, and CD-ROM drives to be had. However, the lack of a single standard means that SCSI devices from one manufacturer are unlikely to work with the SCSI board from another.

As our tests show, neither approach has the speed edge—yet. SCSI may outperform ESDI when controlling multiple drives because the controllers built into SCSI drives let the system retrieve data from several sources simultaneously. Another plus: Some SCSI boards can run up to seven drives, so theoretical maximum capacities can be in the gigabytes. While most LANs currently split such big loads between two or more servers, daisy-chaining will become crucial with *NetWare/386*, which can service up to 250 workstations with one server. —*R. L.*

NSTL TEST REPORT

With Big Hard Disks, Speed Isn't Everything

With the exception of the Micropolis 1578, all these 300MB giants are fast enough to serve your LAN. But no drive takes honors in every situation. The bottom line: Look for solid performance under DOS and NetWare.

DOS

Microsoft C

	seconds
SpeedStor AT335E	239
Innerspace 330-E	245
Micropolis 1558	249
HC AT-380	253
Innerspace 330-S	253
SpeedStor AT320S	259
Micropolis 1578	264
Plus Impulse	266

seconds 0 135 270

Xerox Ventura Publisher (load)

	seconds
Innerspace 330-E	9.9
Micropolis 1558	9.9
HC AT-380	10.1
Plus Impulse	11.4
SpeedStor AT335E	12.8
SpeedStor AT320S	12.8
Innerspace 330-S	12.8
Micropolis 1578	32.4

seconds 0 11 22 33

Xerox Ventura Publisher (print)

	seconds
Plus Impulse	649
Micropolis 1558	653
Innerspace 330-E	654
Innerspace 330-S	656
HC AT-380	659
SpeedStor AT320S	669
Micropolis 1578	1000
SpeedStor AT335E	1043

seconds 0 600 1200

NETWARE

XCOPY

	seconds
Micropolis 1558	1907
Plus Impulse	1948
LANStor LAN335E	1958
LANStor LAN320S	2032
Innerspace 330-E	2074
HC AT-380	2161
Innerspace 330-S	2173
Micropolis 1578	2322

seconds 0 1200 2400

XCOPY with KILLTREE

	seconds
Micropolis 1558	1944
Plus Impulse	1972
LANStor LAN335E	1977
LANStor LAN320S	2054
Innerspace 330-E	2120
HC AT-380	2198
Innerspace 330-S	2242
Micropolis 1578	2409

seconds 0 1200 2400

Foxbase+/LAN (unindexed)

	seconds
LANStor LAN335E	100
LANStor LAN320S	114
Innerspace 330-E	139
Innerspace 330-S	141
Micropolis 1558	148
HC AT-380	157
Micropolis 1578	158
Plus Impulse	162

seconds 0 80 160

Foxbase+/LAN (indexed)

	seconds
LANStor LAN335E	86
LANStor LAN320S	91
Innerspace 330-E	105
Innerspace 330-S	109
Micropolis 1558	111
HC AT-380	115
Micropolis 1578	118
Plus Impulse	134

seconds 0 70 140

Methodology

LAN tests were performed with the hard disks installed in a Compaq 386/20 server configured with 5MB of RAM and running Novell's *NetWare/286 2.15* with the Transaction Tracking System installed. The network had three 12-MHz Compaq 286 Model 20s configured with 1MB of RAM and a 20MB hard disk each; all workstations ran under Compaq DOS 3.31. The workstations used IBM Token-Ring Adapters, while the server used an IBM Token-Ring Adapter II. The drivers for the Token-Ring Adapters were from IBM's *LAN Support Program 1.01* and *NetWare/286*.

Microsoft C
The *Microsoft C* benchmark measures the time required to compile and link *XLISP*'s 25 C source code files and generate a working *XLISP* program. With all files in one directory, this benchmark primarily tests row throughput, as head movement is very limited.

Xerox Ventura Publisher (load)
This benchmark measures the time required to load *Ventura Publisher 2.0*, Professional Extension, and includes the time required to load the hyphenation dictionary into 1.2MB of EMS memory.

Xerox Ventura Publisher (print)
This benchmark compares the times required to print a 12MB multichapter document to a disk file.

XCOPY
XCOPY is used to duplicate a directory structure composed of 400 subdirectories containing 4800 files totaling 75MB of data.

XCOPY with KILLTREE
This benchmark repeats the XCOPY test while the NSTL-developed KILLTREE program simultaneously deletes the 75MB structure created in the XCOPY benchmark. KILLTREE deletes subdirectories and the files they contain.

Foxbase+/LAN (unindexed)
This transaction processing benchmark is run using *Foxbase+/LAN 2*. The following files are used: Accounts (100 bytes per record, 50,000 records); Teller (100 bytes per record, 1000 records); Branch (100 bytes per record, 100 records); Transaction (25 bytes per record, 1000 records); and History (75 bytes per record, 0 to 10,500 records).

The benchmark uses no index. First, a record is read from the Transaction file. The record is located and locked in the Accounts, Teller, and Branch files. A record is then added to the History file and locked. All locked records are updated, and finally, all records are unlocked. Altogether, 500 transactions are processed in the test (100 per workstation).

Foxbase+/LAN (indexed)
The previous *Foxbase+/LAN* test is rerun with four indexes on the History file. This indexed test entails more disk activity and requires more files to be open. The scores represent the average time it takes each workstation to complete the test.

Data based on tests designed and conducted by National Software Testing Laboratories (NSTL). **All rights reserved.**

EXECUTIVE SUMMARY

Micropolis 1558 PC/PAK

Hard disk

It's a solid performer at a rock-bottom price, but the 1558's short warranty and lack of Novell certification make it a risky choice for your busy server.

	POOR	FAIR	GOOD	EXCELLENT
Capacity/expandability			●	
Setup and installation		●		
Compatibility			●	
Warranty			●	
Performance (NetWare)			●	
Performance (DOS)			●	
Overall value			●	

Reader service no. 666

DOS, it's solid but nothing special. The drive is Novell certified—but not with the controller Micropolis is now using, according to Novell, and the controller limits you to two drives per PC.

Configuring the 1558 is a hands-on job for patient professionals only. The drives aren't low-level formatted, setup is confusing, the user manuals contain erroneous instructions, and the company's technical support isn't much help.

NetWare installation, fortunately, is streamlined by Ontrack's *Disk Manager*, which creates and verifies a *NetWare* partition (in about an hour), short-circuits COMPSURF, and, if necessary, patches *NetWare 2.0a* so it can recognize the drive. However, if the drive is defective, it may take hours for *Disk Manager* to confirm this fact.

The 1558 is limited as a DOS drive as well. *Disk Manager* can automatically create a small, bootable C: drive and a giant D:, or a slew of 32MB drives. Only with DOS 4.0 can you create a single giant C: drive.

The 1558 is a fast drive for the price, but questions about its Novell certification and DOS compatibility blunt its appeal. Spend the extra $800 and get Priam's three-year warranty.

Micropolis 1578 PC/PAK

Micropolis's 1578 SCSI drive shares the 1558's low price—and its flaws. It's also slow, trailing the pack in both *NetWare* and DOS tests. What's more, it's not Novell certified or pre-COMPSURF'd. Consequently, the 1578 is not recommended.

Configuring the 1578 and the 1558 are almost identical tasks. But installing *NetWare* on the 1578 is a pain because its version of *Disk Manager* isn't *NetWare*-aware. You'll have to dig through README files and copy a confusing array of files to the drive, and even then it may not work. DOS installation is straightforward, but even with DOS 4.0, you can't set up one giant bootable C: drive.

EXECUTIVE SUMMARY

Micropolis 1578 PC/PAK

Hard disk

The 1578 is very cheap, but overall value is only fair. It trailed the pack badly in both DOS and *NetWare* tests, and it shares the 1558's problems as well.

	POOR	FAIR	GOOD	EXCELLENT
Capacity/expandability				●
Setup and installation		●		
Compatibility		●		
Warranty			●	
Performance (NetWare)	●			
Performance (DOS)	●			
Overall value		●		

Reader service no. 666

Plus Impulse

Plus Development's Hardcard set a standard in the storage business with its plug-and-play installation, lucid documentation, and top technical support. The Plus Impulse may do the same in the network world. Instead of selling one immutable 300MB drive, the company offers modular 40MB or 80MB half-height drives that you can easily fit together like building blocks for a total of 1.3GB of server storage. It's Novell certified and requires only an abbreviated, 30-second

The Plus Impulse's modular 40MB and 80MB half-height drives fit together like building blocks.

As a NetWare server, the Priam 330-E is a bit slower than the leaders but not slow enough to be troublesome.

EXECUTIVE SUMMARY

Plus Impulse

Hard disk

The Impulse's winning combination of easy installation, painless expandability, and top technical support makes it the only safe choice if you're an amateur stuck with setting up a server yourself. But the price is high, the warranty short, and expandability limited.

	POOR	FAIR	GOOD	EXCELLENT
Capacity/expandability			●	
Setup and installation				●
Compatibility			●	
Warranty			●	
Performance (NetWare)			●	
Performance (DOS)			●	
Overall value			●	

Reader service no. 667

COMPSURFing. The downsides: Plus doesn't offer any drive exceeding 80MB, and the Impulse is the priciest storage buy in the roundup at more than $17 per megabyte stored. However, it's the only one an amateur can install.

The Impulse's performance ranged from average to superior in our *NetWare* tests. Desktop publishers and data base users should note that it whipped through the *Ventura* tests—and came in dead last in some *Foxbase* trials.

The Impulse system has several distinct advantages. You can daisy-chain up to 8 drives off its proprietary controller. Unlike the other drives reviewed, each Impulse has 64K of built-in cache RAM. According to Plus, the benefits of the cache increase as you add drives, so six Impulses should be faster than two. Data safety is also assured, since one sector per cylinder is set aside as a replacement.

As with the Hardcard, configuring the Impulse is essentially automatic; if things go wrong, the drive will even display correct switch settings and other information. Plus's install program automatically prepares disks for *NetWare*, and the manual leads you through every step of running Netgen. If you create a DOS Impulse drive, the install program automatically formats all disks with the largest allowable partitions (80MB with DOS 3.31 or later, 32MB with earlier versions) and modifies CONFIG.SYS.

The Plus Impulse wins big points for ease of installation, solid performance, and expandability as your network grows. If expert help isn't available—and if you can pay the steep tariff—the Impulse is the best solution.

Priam Innerspace 330-E

Priam's Innerspace 330-E ESDI drive is the top DOS performer, and its moderate $3630 price tag, Novell certification, and three-year warranty put it ahead of the crowd. As a *NetWare* server, it's a bit slower than the leaders but not enough to be troublesome. Expandability is limited to two drives per PC, and though the drive is factory COMPSURF'd, installing *NetWare* can be tricky.

Priam's step-by-step pamphlet makes *NetWare* installation relatively simple, but the user manual contains outdated, conflicting instructions. Installing DOS is a matter of creating a bootable floppy and running some

EXECUTIVE SUMMARY

Priam Innerspace 330-E

Hard disk

Its three-year warranty, reasonable price, Novell certification, and superior performance make the 330-E the best choice overall. It's not a Best Buy due to its tricky installation and compatibility problems—headaches you'll want to leave to your dealer.

	POOR	FAIR	GOOD	EXCELLENT
Capacity/expandability			●	
Setup and installation		●		
Compatibility		●		
Warranty				●
Performance (NetWare)			●	
Performance (DOS)				●
Overall value			●	

Reader service no. 668

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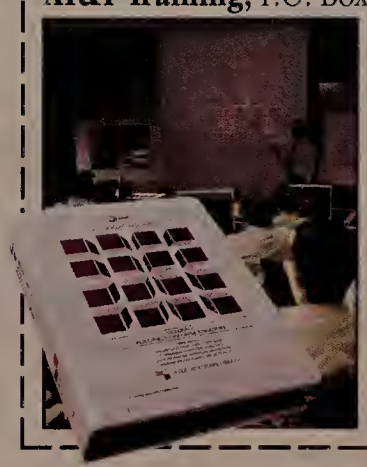

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PC MAGAZINE, SEPTEMBER 12, 1989

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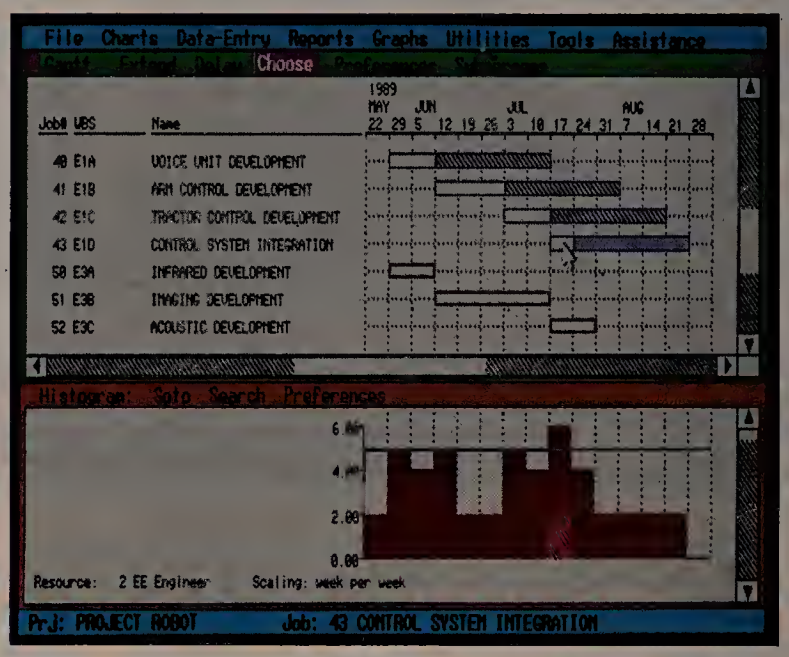

Our Gantt Histogram pinpoints resource overloads.

EXPERT TESTIMONY

PC WEEK, MARCH 13, 1989:
"Easy for novices to learn, but packs enough power and functionality for experienced project managers."

DESIGN NEWS, MARCH 27, 1989:
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DANIEL YAHDAV, PM SOLUTIONS, JUNE 1989:
"Project Scheduler 4 earns PM Solutions' highest marks in ease of use. It leads its competition in schedule recalculation and resource leveling performance."

PC MAGAZINE, SEPTEMBER 12, 1989:
"Context-sensitive help and three levels of automatic prompting offer enough assistance that you may never open the fine manual that accompanies the program."

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INFO WORLD, SEPTEMBER 25, 1989:
"Project Scheduler 4 is the one program you can't ignore."

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prompt-driven utilities. The biggest hurdles are incompatibilities. The drive's ESDI controller is incompatible with the Compaq Deskpro 386's multifunction card, which would force you to buy a new parallel/serial board. Various other incompatibilities were overcome only after much help from Priam's technical support group and a lot of trial and error.

Despite the hassles, the 330-E's DOS performance, competitive price, and generous warranty make it the drive of choice for DOS power users and for DOS-based LANs such as *3+Share*. While it doesn't give *NetWare* LANs the same speed boost, the three-year warranty makes it the best choice for most users—as long as your dealer handles installation.

Priam Innerspace 330-S

Priam's Innerspace 330-S SCSI drive matches the 330-E in price and warranty, but it's slower on both DOS and *NetWare* tests and isn't Novell certified. On the other hand, installing DOS or *NetWare* on the 330-S is relatively glitch-free.

Unfortunately, the news doesn't get better. Workstations froze when applications were run from the server—the result of a conflict between the drive and the server's EtherLink II adapter. Replacing the Ethernet board with an earlier model solved the problem.

The 330-S's competitive price and expansive warranty are positives, but the 330-E clearly has the edge.

EXECUTIVE SUMMARY

Priam Innerspace 330-S
Hard disk

The 330-S shares the 330-E's reasonable price and three-year warranty, and it's easier to install. But it lags a bit under NetWare, and it's downright slow under DOS.

	POOR	FAIR	GOOD	EXCELLENT
Capacity/expandability			●	
Setup and installation			●	
Compatibility			●	
Warranty				●
Performance (NetWare)		●		
Performance (DOS)		●		
Overall value			●	

Reader service no. 668

EXECUTIVE SUMMARY

Storage Dimensions LANStor LAN320S
Hard disk

This NetWare-only drive is fast, relatively painless to install, and tops in NetWare expandability. But the short warranty and lack of Novell certification make this a second choice.

	POOR	FAIR	GOOD	EXCELLENT
Capacity/expandability				●
Setup and installation			●	
Compatibility		●		
Warranty			●	
Performance (NetWare)			●	
Performance (DOS) n/a				
Overall value		●		

Reader service no. 669

Storage Dimensions LANStor LAN320S and SpeedStor AT320S

The *NetWare*-only LANStor LAN320S and DOS-only SpeedStor AT320S are the same drive, but they use different SCSI controllers and software. Neither drive is particularly appealing. The AT320S is a bit behind the pack in speed tests. Expandability, however, is superior. You can attach seven AT320S's to a single controller for a grand total of 2.2GB; the *NetWare*-oriented LAN320S tops out at 4GB. The LAN320S comes pre-COMPSURF'd, but it is not Novell certified.

Still, the LAN320S performed very well on NSTL's *NetWare* trials and was edged out only by the company's LAN335E and, on occasion, by the Plus Impulse and the Micropolis 1558. No compatibility problems were encountered with the LAN320S, but note that the unit *PC World* tested was a Maxstor

The Storage Dimensions LAN320S performed very well on NSTL's NetWare trials and was edged out only by the LAN335E.

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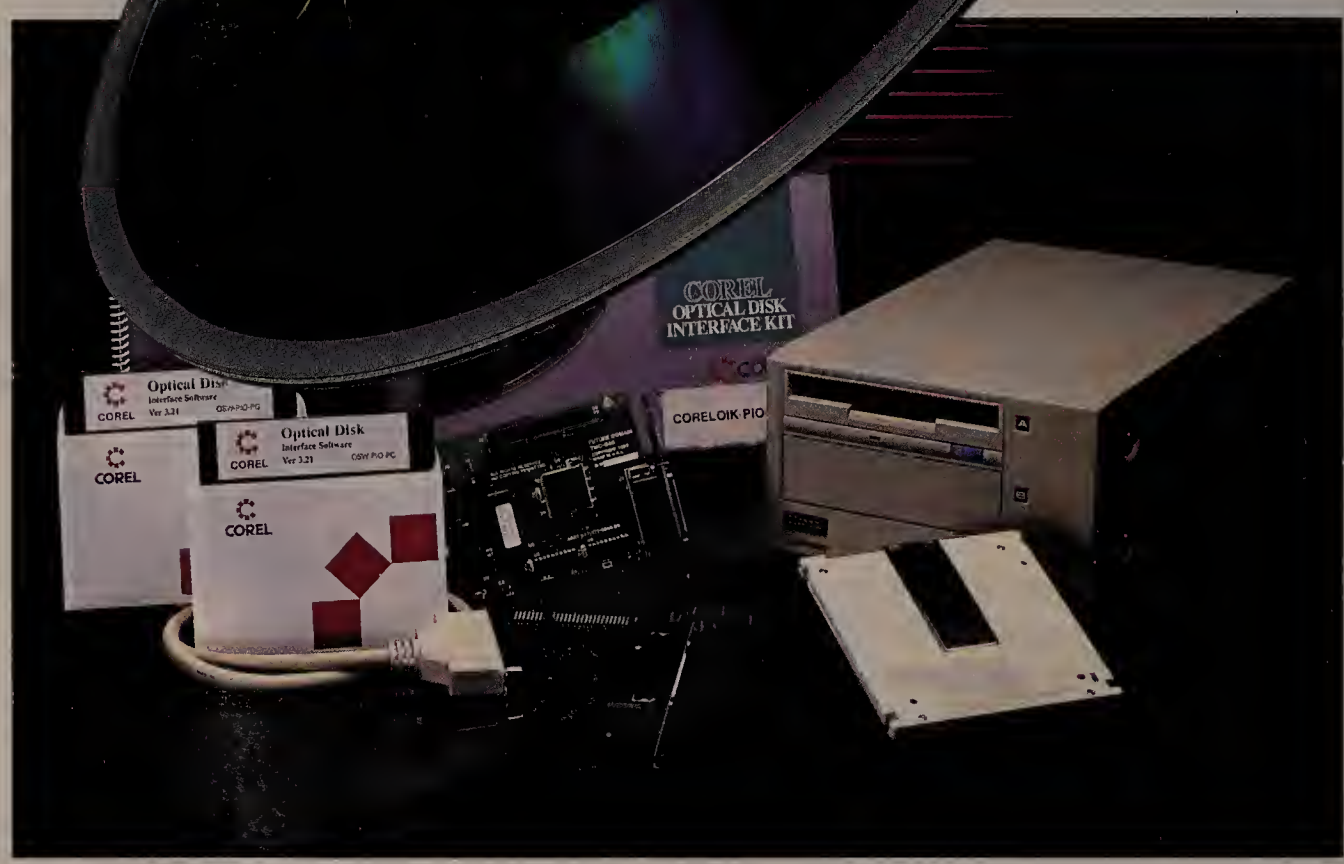

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Circle 48 on reader service card

EXECUTIVE SUMMARY

Storage Dimensions SpeedStor AT320S
Hard disk

This DOS version of the LAN320S can be doisy-chained for up to 2.3GB of storoge. But it's not a winner: It's slower than the Priom, tedious to instoll, ond hos difficulties with DOS 3.31 ond 4.0.

	POOR	FAIR	GOOD	EXCELLENT
Capacity/expandability			●	
Setup and installation	●			
Compatibility		●		
Warranty			●	
Performance (NetWare) n/a				
Performance (DOS)		●		
Overall value		●		

Reader service no. 669

3280S drive and that the company sometimes ships a CMS Wren IV instead.

Setting up either drive is a snap, and a menu-driven utility takes *NetWare* installation on the LAN320S up to the point that you run Netgen. Installing DOS on the AT320S is straightforward but far too tedious, given the steep price. The process involves typing in the drive's defect list from a supplied printout, sitting through hours-long low-level formats and volume verification, and so on. A bigger flaw: If you put the AT320S in some 20-MHz Compaq Deskpro 386s and create bootable partitions exceeding 32MB with PC-DOS 4.0 or Compaq DOS 3.31, the drive won't boot.

Both drives are competent and fairly easy to install. But the AT320S's DOS problems and the LAN320S's minimal expandability, higher price, and slim warranty keep them out of the winner's circle.

Storage Dimensions LANStor LAN335E and SpeedStor AT335E

These two ESDI drives are identical but for their accompanying software. Like their 320S counterparts, the *NetWare*-specific LANStor LAN335E is fast, and the DOS-specific SpeedStor AT335E is middling; the price tag for each drive is about $4000. Unlike with the 320S drives, supplied documentation is incomplete and out of date, expansion is limited to one additional drive, and hardware installation can be a pain. Two pluses: The LAN335E is pre-COMPSURF'd and is certified by Novell.

The LAN335E zipped ahead of the crowd in our multiuser *NetWare* data base test, beating its peers by 5 to 12 minutes, and paced the pack in other tests. The AT335E, however, trailed badly in the DOS printing and data base heats.

NetWare installation on the LAN335E is similar to that on the LAN320S but requires you to patch *NetWare* so that 80286 computers can recognize the drive. Unfortunately,

EXECUTIVE SUMMARY

Storage Dimensions LANStor LAN335E
Hard disk

Like the LAN320S, this is a fast, NetWore-only drive. But poor documentotion, limited exponsion, and an unreliable NetWare potch knock the speedy LAN335E out of the running.

	POOR	FAIR	GOOD	EXCELLENT
Capacity/expandability			●	
Setup and installation			●	
Compatibility			●	
Warranty				●
Performance (NetWare)				●
Performance (DOS) n/a				
Overall value			●	

Reader service no. 669

this step isn't mentioned in the manual. That—along with various "anomalous problems" with the patch—makes installation and day-to-day use perilous. DOS installation on the AT335E is identical to that on the 330-E—tedious.

The LAN335E's performance is tops, but it's expensive and hard to install, and its *NetWare* patch is unstable. And the AT335E is just too slow. Neither is a smart buy.

The LAN335E zipped ahead of the crowd in our multiuser NetWare data base test, beating its peers by 5 to 12 minutes.

EXECUTIVE SUMMARY

Storage Dimensions SpeedStor AT335E

Hard disk

This DOS version of the LAN335E won't win many fans. DOS performance ranges from good to poor, expandability is limited to one drive, and setup is tedious.

	POOR	FAIR	GOOD	EXCELLENT
Capacity/expandability			●	
Setup and installation			●	
Compatibility				●
Warranty				●
Performance (NetWare) n/a				
Performance (DOS)			●	
Overall value			●	

Reader service no. 669

Wrap It Up, I'll Take It

None of the reviewed drives combines the low price, top performance, easy installation, and good product support that merit a Best Buy.

If your dealer installs it, the Priam Innerspace 330-E is the best deal in the round-up. Performance is solid under *NetWare* and excellent under DOS. While the Micropolis 1558 is cheaper, Priam's three-year warranty is worth the extra cost. If you're on your own, your only safe bet is the Plus Impulse. Its easy installation, painless expandability, and top support put it in a class by itself. ●

Robert Lauriston is an assistant editor for PC World.

For more information about all products in this article, circle reader service no. 907.

WHERE TO BUY

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Core Int'l, Inc.
7171 N. Federal Hwy.
Boca Raton, FL 33487
407/997-6055
LIST PRICE: $5490
ACCESSORIES: preloaded NetWare 2.15 $2500, 2.15 SFT $4200
REQUIREMENTS: DOS 3.3 or later version, NetWare/86 or later version
WARRANTY: three years parts and labor
EXTENDED WARRANTY: none
TECHNICAL SUPPORT: toll number, M–F 8 a.m.–10 p.m.
OTHER SUPPORT: none
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Micropolis 1558 PC/PAK, 1578 PC/PAK
Micropolis Corp.
21211 Nordhoff St.
Chatsworth, CA 91311
818/709-3300
LIST PRICE: $2645
ACCESSORIES: none
REQUIREMENTS: DOS 3.0 or later version, NetWare 2.0a or later version
WARRANTY: one year parts only, 30-day money-back guarantee
EXTENDED WARRANTY: none
TECHNICAL SUPPORT: toll number, M–F 7–6
OTHER SUPPORT: company BBS
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Plus Impulse
Plus Development Corp.
1778 McCarthy Blvd.
Milpitas, CA 95036
800/826-8022
LIST PRICE: 40MB drive $895, 80MB drive $1195, controller $295
ACCESSORIES: external chassis for two drives $645
REQUIREMENTS: 256K, DOS 3.0 or later version, NetWare 2.1 or later version
WARRANTY: one year parts and labor
EXTENDED WARRANTY: none
TECHNICAL SUPPORT: toll-free number, M–F 6–6
OTHER SUPPORT: none
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Priam Innerspace 330-E, Innerspace 330-S
Priam Corp.
350 E. Plumeria
San Jose, CA
95134-2085
408/434-9300 ext. 6800
LIST PRICE: $3630
ACCESSORIES: none
REQUIREMENTS: 512K, DOS 3.0 or later version, NetWare 2.1 or later version (NetWare 2.0a requires Novell DCB board)
WARRANTY: three years parts and labor
EXTENDED WARRANTY: available through third party
TECHNICAL SUPPORT: toll number, M–F 6:30–4:30
OTHER SUPPORT: BBS, fax
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Storage Dimensions LANStor LAN320S, LANStor LAN335E, SpeedStor AT320S, SpeedStor AT335E
Storage Dimensions, Inc.
2145 Hamilton Ave.
San Jose, CA 95125
408/879-0300
LIST PRICE: LAN320S $4100, LAN335E $4150, AT320S $3980, AT335E $4025
ACCESSORIES: none
REQUIREMENTS: DOS 2.0 or later version for SpeedStor drives; NetWare 2.1 or later version for LANStor drives
WARRANTY: one year parts and labor
EXTENDED WARRANTY: none
TECHNICAL SUPPORT: toll number, M–F 7–6
OTHER SUPPORT: company BBS, newsletter
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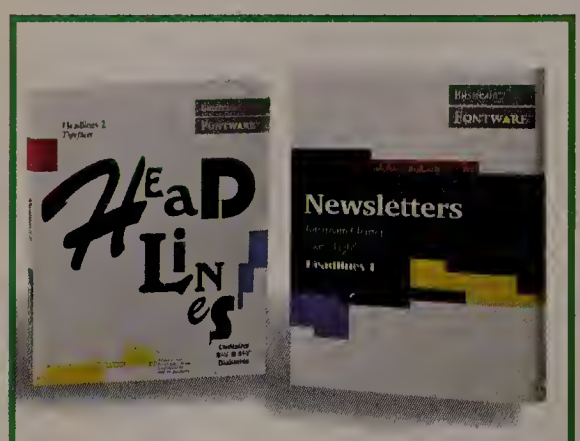
As the holidays near



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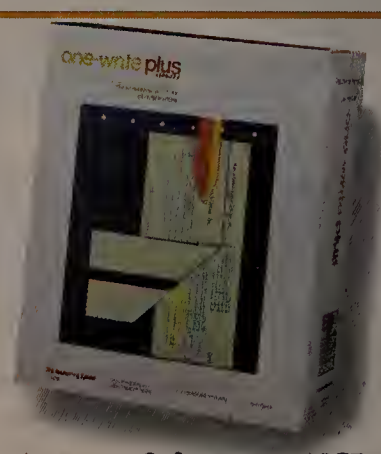

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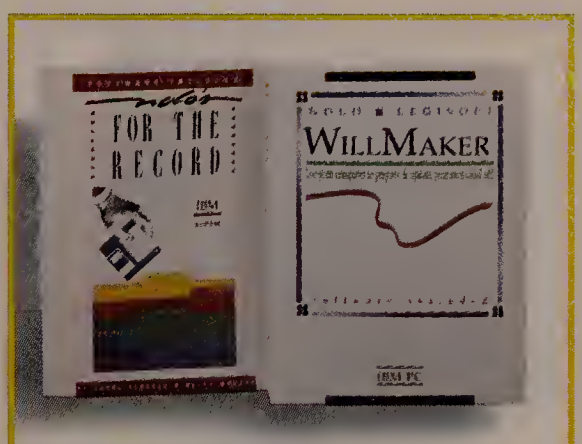

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5410 ☐QuickC 2.01 w/Assembler . . . . . 139.
2880 ▣Macro Assembler 5.1. . . . . 99.
2859 ▣Fortran Compiler 5.0 . . . . . 289.
2853 ▣C Compiler 5.1 . . . . . 299.

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5995 ▣Marq Plus 1.0 . . . . . 59.

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4924 ☐Super PC-Kwik 3.3 . . . . . 49.
4925 ☐PC-Kwik Power Pak 1.3 . . . . . 79.

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2970 ▣Clipper *(Summer '87)* . . . . . 429.

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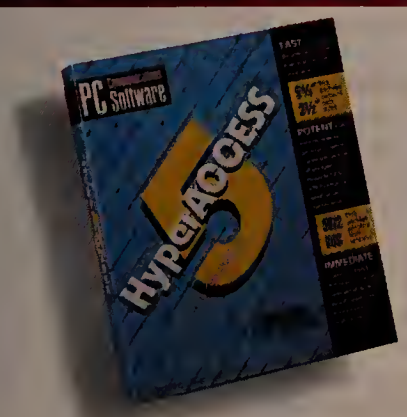
3004 ▣Graph-in-the-Box 2.2. . . . . 75.
4337 ☐GB-Stat 1.5 . . . . . 159.



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2899 ☐Windows 286 2.1 . . . . . 69.
2904 ☐Works 2.0 . . . . . .99.
2900 ▣Windows 386 2.1 . . . . . 129.
2890 ▣Multiplan 4.01 . . . . . 135.
2901 ☐Word 5.0 . . . . . 209.
2903 Word 5.0 Network Add. Stations . . 135.
2856 ▣Excel 2.1 *(req. 80286/80386)* . . . call
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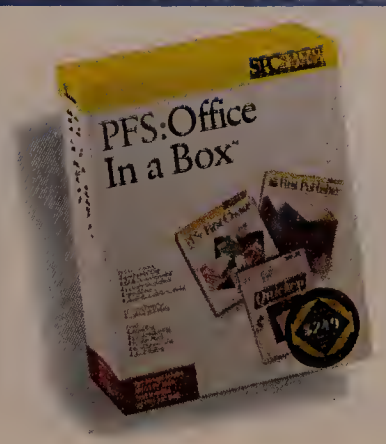
6033 ▣Excel for OS/2 1.0 . . . . . 339.
2891 ▣Project 4.0. . . . . 329.



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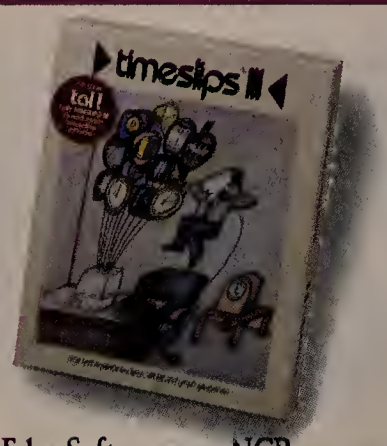

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5122 ☐For The Record 1.0..... 35.

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2987 ☐Timeslips III 3.4..... 169.

Norton-Lambert ... NCP
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4929 ☐Close-Up Support 3.0..... 165.
5420 ☐Close-Up LAN *(8 user)*..... 529.

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3220 ☐DESQView 2.26..... 79.
4586 ☐DESQView 386..... 129.

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4396 ☐Grammatik IV 1.0..... 52.

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4480 ☐VGA Dimmer 2.01 *(screen saver)*. 19.
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Rightsoft ... NCP
4155 ☐Rightwriter 3.1..... 54.

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3727 ☐DeskLink 2.21..... 99.

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3561 ☐True BASIC 2.1..... 52.

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3765 ☐SoftBytes 2.0..... 35.

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1417 ☐Where/Europe Carmen Sandiego? 29.
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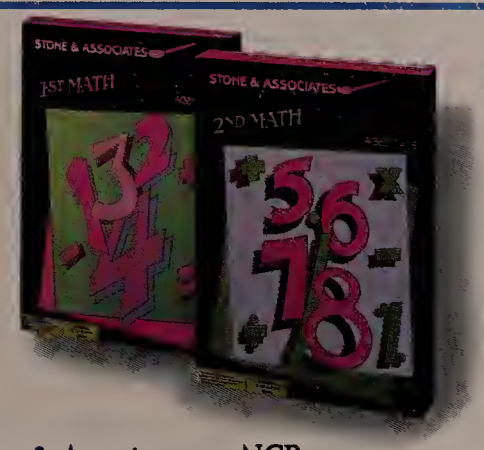

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4107 RAMpage Plus 286 512k..... 419.
4105 RAMpage Plus MicroChannel 512k 469.

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5788 HL-8Ps PostScript Laser Printer ... call
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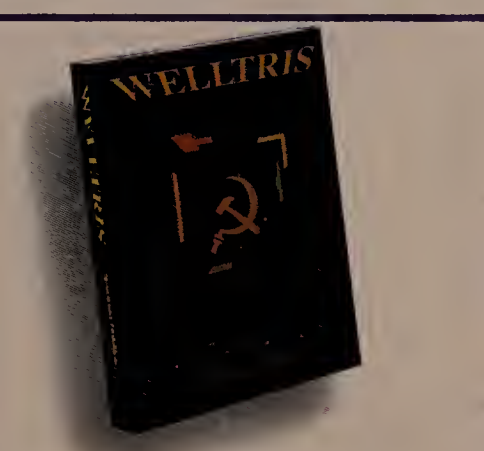

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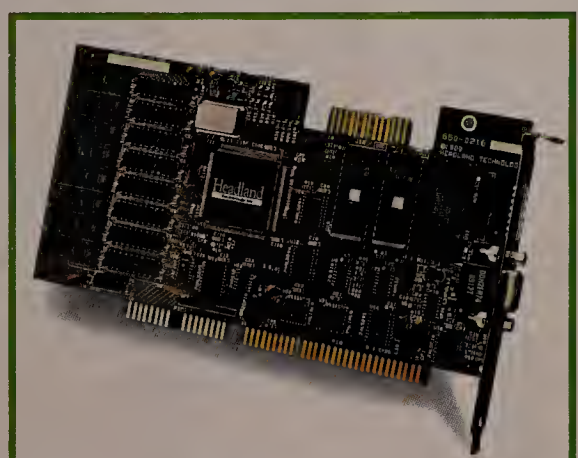

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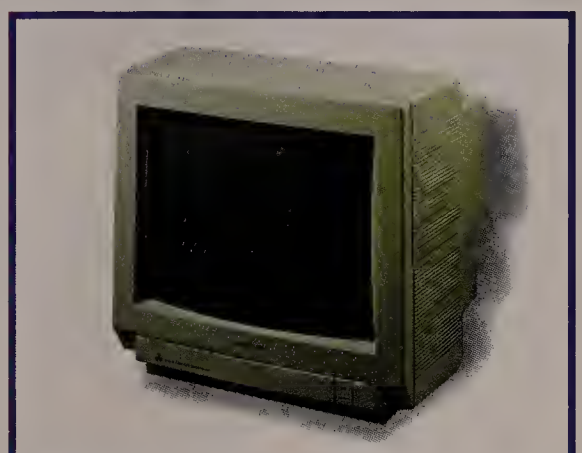

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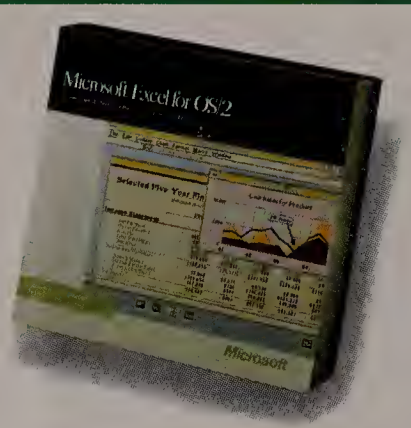

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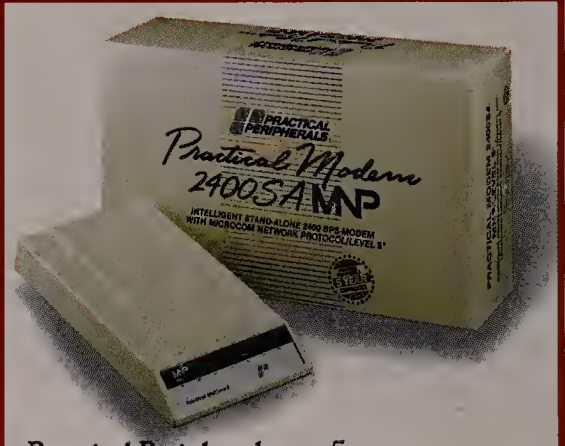
2790 Maxell MD2-HD *(10 disks per box)* . 19.



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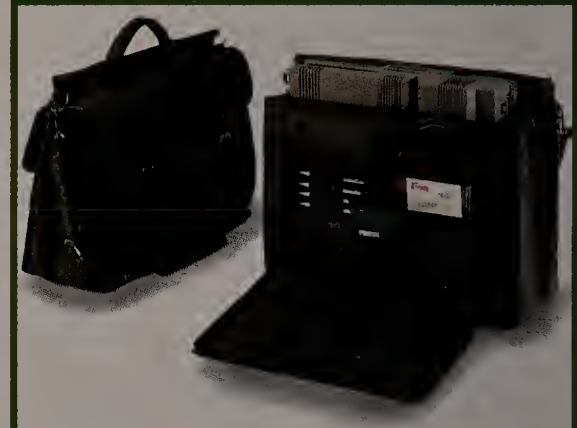

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High-Speed Modems—Files in the Fast Lane

If the phone line is your data lifeline, then one of these 9600-bps-and-up modems may be worth the high price tag.

Compatibility is no problem, and throughput is faster than ever.

TJ Byers

If you've put off buying a high-speed modem because of conflicting standards, you're not alone. Until recently, modems communicating at 9600 bps and faster were feasible only if you installed the same make and model throughout branch offices. Hayes compatibility meant you could talk to the rest of the world at 2400 bps, but you were also limited to this speed when swapping files between different brands of high-speed modems.

Thanks to the rising popularity of the V.32 data-transfer standard and the MNP-5 error-correction/data-compression protocol, this situation is changing. Today plenty of modems combine V.32 and MNP-5 to deliver high-speed compatibility. This roundup examines five V.32/MNP-5 external modems that all exceed 9600 bps and cost from $1145 to $1799: the Microcom QX/V.32c, the Multi-Tech MultiModem V.32, the Racal-Vadic 9632VP, the Universal Data Systems (UDS) V.3225, and the U.S. Robotics Courier HST Dual Standard.

The key benefit of V.32 is its widespread support. With V.32/MNP-5 modems, you no longer have to make bulk purchases to get your money's worth. Any V.32 modem can talk to any other V.32 modem at 9600 bps, and when you add MNP-5, they communicate at the highest speed of the slower modem, ranging from 15,000 to over 20,000 bps.

Despite the ascendance of V.32 and MNP-5, proprietary protocols still hang on. For example, Hayes's V-series Smartmodem 9600 V.42 matches a proprietary transfer protocol with the new V.42 error-correction/data-compression scheme.

If Hayes's transfer standard is a bit out of touch, its support for V.42 is forward-looking. Most vendors plan to add the faster V.42 to their V.32 modems eventually, but MNP-5 should dominate for at least another year, and many vendors will include both protocols. Meanwhile, V.32 is here to stay, and you'll be able to upgrade a modem's BIOS to V.42 if you need it. (For more details, see the sidebar "V-Something: Clarifying High-Speed–Modem Standards.")

Today's V.32/MNP-5 modems offer the best deals in the high-speed marketplace. Not only do they deliver intermodem compatibility, they're usually faster than modems using proprietary protocols and more reliable on dirty phone lines.

Whatever the protocol, high-speed modems aren't for everyone. "Low-cost" models run about $1200, compared to about $400 for high-end, MNP-5 2400-bps modems and $200 for non-MNP 2400-bps units. If you don't

PIERRE-YVES GOAVEC

frequently send large files between PCs, 2400 bps is still the way to go. Yet, as the PC world turns to graphics and file sizes grow, high-speed modems make more sense.

Quick, Clean, and Compatible

In evaluating these modems, one key factor was their compatibility with V.32, MNP-5, the Hayes AT command set, and popular communications packages. Equally critical were performance and data reliability, followed by price. Far less important are setup procedures and panel controls.

All five modems passed the V.32/MNP-5 tests with flying colors. Each modem could swap files with every other modem tested, and in each case the throughput matched the fastest speed of the slower modem.

NSTL tests not shown here indicate that most of the modems were highly compatible with the Hayes AT command set. Compatibility with communications packages was also good, with a few key exceptions.

In the performance tests, a Telecom Analysis Systems (TAS) VoiceBand Channel Simulator was used to mimic various phone line conditions. In the key benchmark, the same model was placed on each end of an average, business-quality line, and the modems exchanged a variety of files. Text and data base files were usually fastest, followed by spreadsheets and then binary and graphics files.

The fastest modem was the Microcom QX/V.32c, which averaged 18,893 bps using MNP-5 and 24,884 bps using its proprietary MNP-9 protocol. Next in line was U.S. Robotics' Courier HST Dual Standard, which averaged 18,116 bps. The speed of these two modems is due largely to their 38,400-bps PC-to-modem interfaces. The other three modems' interfaces are limited to 19,200 bps. Their test scores average about 16,000 bps, but their low prices make for a good price/performance ratio.

The TAS unit also simulated various phone line impairments that are fairly common on business-quality lines. The first test checked responses to drop-off, a sudden plunge in signal strength that often causes a modem to hang up. The modems were then confronted with high levels of line noise (common static) and various forms of phase-

FEATURES EVALUATION

Bright Lights, Fast Modems

Flashy panel controls are welcome, but fast throughput is essential. Price-sensitive users should look for a high price/performance ratio.

● Yes
○ No
◒ Deficient

	Microcom QX/V.32c	Multi-Tech MultiModem V.32	Racal-Vadic 9632VP	Universal Data Systems V.3225	U.S. Robotics Courier HST Dual Standard
Standard features					
Price	$1799	$1195	$1195	$1145	$1595
Average speed (bps)[1]	24,884[2]	15,234	15,961	16,357	18,116
Price/performance ratio (bps per dollar)	13.83[2]	12.75	13.36	14.29	11.36
Setup and configuration					
DIP switches	●	●	○	○	●
ROM setup	○	○	○	●	○
Software setup	●	●	●	●	●
Controls					
Power switch	○	●	○	●	●
Speaker-volume knob	●	●	●	○	●
Alphanumeric display	○	○	○	●	○
Voice/data switch	●	●	●	●	○
Originate/answer switch	●	●	●	◒[3]	○
Speed switch	○	●	●	◒[3]	○
MI/MIC jack	●	●	●	○	○

[1] Based on NSTL's overage line tests, not on dirty line tests.
[2] Based on MNP-9 results. MNP-5 results (18,893 bps) would deliver a bps-per-dollar ratio of 10.5.
[3] Requires entering complex panel-button sequence.

shift jitter, a drift in the timing of the echo reflected off relays along the phone line.

The modems handled all line impairments at top speed, except for low-frequency phase-shift jitter. Although MNP error correction ensured reliable transfers, most of the modems slowed by 40 to 45 percent during severe jitter. The Multi-Tech dipped only 29 percent, and the UDS weathered the storm without slackening.

Finally, performance was tested at lower speeds. All these speedsters function reliably as Hayes-compatible 300/1200/2400-bps modems, automatically dropping down to the highest usable data rate. Any of these modems can communicate at 4800 bps with 2400-bps models that include MNP-5.

Controlling the Beast

If your modem's blazing speed gives you a competitive edge, you probably won't worry about panel controls and setup procedures. The controls are usually duplicated in communications packages, and you'll probably never configure your modem—all but the Multi-Tech worked fine with popular packages without requiring a change in setting.

Setup procedures vary. You can set up all the modems with Hayes AT commands via software. But most of the modems offer easier alternatives. Three of the modems can be configured by DIP switches, and the Racal-Vadic and UDS offer panel button sequences.

All the units provide both line and phone jacks. All but the U.S. Robotics Courier and UDS furnish an MI/MIC (Mode Indicator/Mode Indicator Common) jack so you can attach a Bell 801-type device. If you're using your modem as a network gateway, you might want to install an 801-type callback unit for security.

All the modems offer LED lights except for the UDS, which provides an LCD display. Three of the modems have voice/data and originate/answer switches, and two provide a speed switch. Generally, these switches are

EXECUTIVE SUMMARY

Microcom QX/V.32c

High-speed modem

The speedy QX/V.32c can swap text files with another QX/V.32c at an incredible 33,333 bps, making it an excellent choice for volume buyers. But top speed doesn't come cheap.

	POOR	FAIR	GOOD	EXCELLENT
Performance				●
Software compatibility			●	
Hayes AT compatibility				●
Setup and configuration		●		
Panel controls			●	
Overall value				●

Reader service no. 601

useful only on terminals that lack communications software.

The following reviews take a closer look at the modems. They reveal some surprising bargains.

Microcom QX/V.32c

If speed thrills, and if you plan on using the same modem throughout an enterprise, the Microcom QX/V.32c is the modem for you. The fastest in the roundup at MNP-5, it's even faster when two QX/V.32c's link up with their unique MNP-9 protocol. Who cares about the QX/V.32c's high $1799 price when you can blast text files at 33,333 bps?

Because the QX/V.32c's average MNP-5 speed is faster than its rivals', its MNP-9 results are more significant in our comparisons. When two QX/V.32c's mambo, you can expect an average speed about 35 percent faster than that of the three slowest modems reviewed. Binary and graphics file tests are on a par with the second-rated Courier, but text and data base files fly at about twice the speed of the slower modems.

Configuring the QX/V.32c is a pain. You set DIP switches on both the front and back, and you must pop out a panel to get at the front DIPs. The modem provides voice/data

V-SOMETHING: CLARIFYING HIGH-SPEED-MODEM STANDARDS

The V.32 and V.42 protocols sound like they're related, but they're not. V.32 is a transfer protocol, which controls the physical transfer of data between modems. For example, it defines the *modulation* technique, the process of changing digital bits to analog tones and vice versa.

V.42 and MNP-5, on the other hand, are rival protocols that both handle error correction and data compression. Their correction components check for errors, retransmitting data if necessary. The compression algorithm boosts transmission speed by squeezing a file on one end of the line and unsqueezing it on the other.

For two modems to transfer data at high speed, they must be compatible at both the transfer level and the correction/compression level. At a minimum, they must share the same transfer protocol. Without transfer-level compatibility, 9600-bps modems are limited to 2400-bps transfers. Two modems that share a transfer protocol such as V.32 can reliably swap data at 9600 bps, as long as they're using the same software-based error-correction protocol, such as Kermit. However, two modems sharing the same transfer protocol and also using the same hardware-based correction/compression protocol can achieve the highest possible speeds, often beyond 15,000 bps.

V.32 modems are particularly fast because they provide *full-duplex* (two-way) communications. By sending and receiving data simultaneously, one modem can return error-checking data while the other sends a file. A V.32 modem uses *echo cancellation* technology to keep the two signals distinct. By subtracting its own signal echo from the jumble, a modem can distinguish incoming data.

V.32 modems also use *Trellis encoding*, which corrects most errors caused by noisy phone lines. Trellis encoding is called a *forward* error correction protocol because the receiving modem can fix most errors without a retransmission. This leaves less error-correcting work for MNP-5 or V.42, resulting in faster throughput.

MNP-5 and V.42 boost throughput further. Although error correction can slow transfers on dirty lines, both protocols use an efficient *synchronous framing* technique that speeds transfers by 20 percent on average lines. MNP-5 compression can then double throughput, and the new V.42 compression (too late for testing) may even triple throughput.

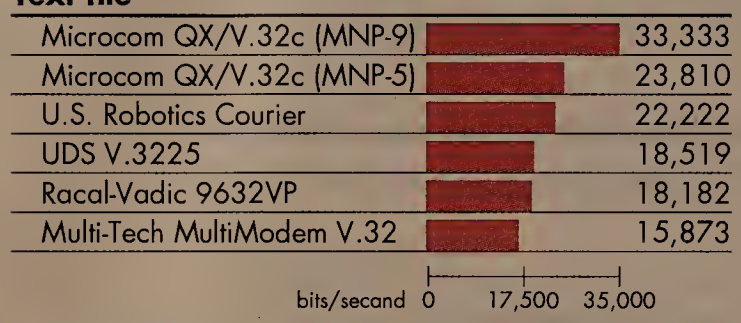
V.42 and MNP-5 are compatible only at the correction level, not at the compression level. Thus, when MNP-5 talks to V.42, you get only a 20 percent speed improvement instead of the 50 percent boost that occurs when both modems share a protocol. Unfortunately, one of the few modems that use V.42, the Hayes V-series V.42 (which also includes MNP-5) is limited to 4800 bps when talking to a V.32/MNP-5 modem because its transfer protocol is incompatible with V.32. The moral: make sure your transfer protocol is compatible before you worry about correction and compression.
—TJB

Microcom's V.32 Modem: Fastest in a Fast Crowd

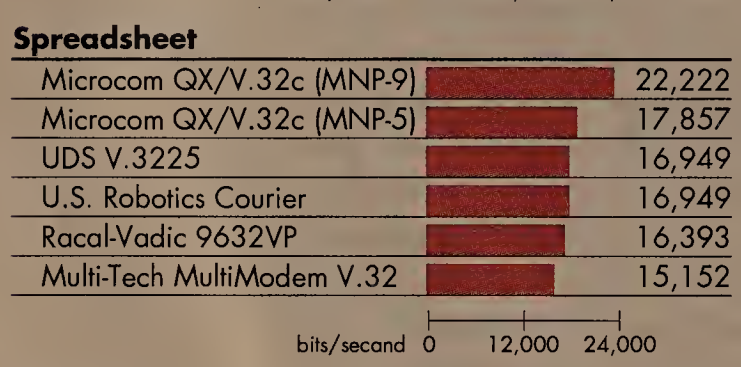
The Microcom QX/V.32c sets new records with its proprietary MNP-9 protocol and leads the high-speed V.32 modem race when using the industry-standard MNP-5. The UDS V.3225 is the only modem tested that runs at top speed on a dirty line.

Average Line

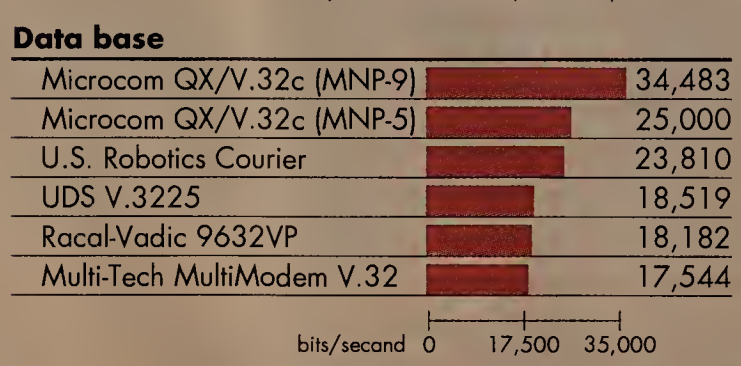
Text file



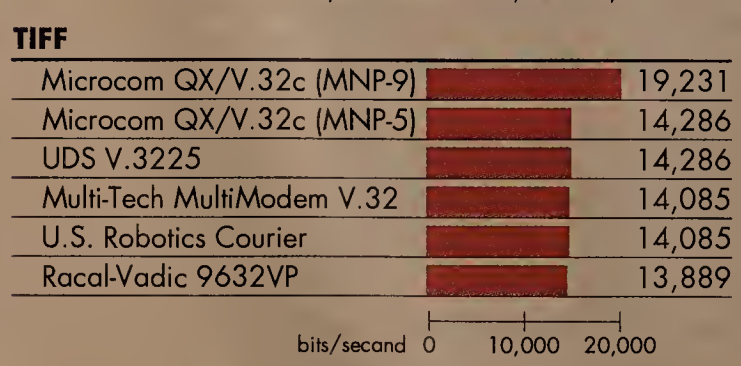
Spreadsheet



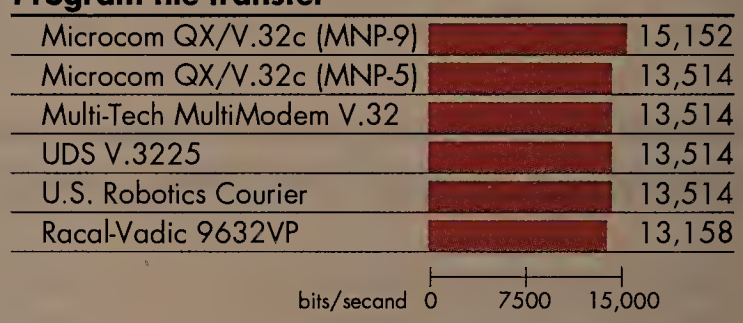
Data base



TIFF

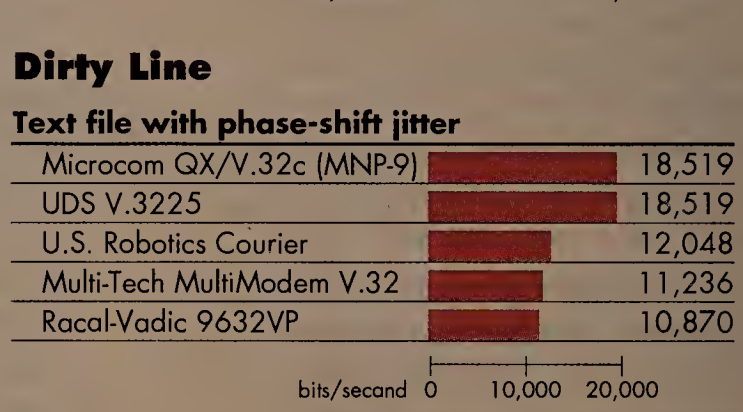


Program file transfer



Dirty Line

Text file with phase-shift jitter



Methodology
These benchmarks measure the modems' throughput in bits per second (bps) when transferring different types of files under various line conditions. The modems were tested with two 12-MHz Compaq Deskpro 286 Model 20s with 20MB hard disk drives. Transfers were completed using the *Crosstalk Mk.4* communications program and the YMODEM-G file transfer protocol. Identical modems were used on each end of the link. A TAS 1010 VoiceBand Channel Simulator was used to add impairments and reproduce conditions commonly found on phone lines. Settings for each line type were based on the 1982–1983 AT&T Bell Labs *End Office Connection Study*, which measured impairments on long-distance phone lines.

Average Line
Two modems plugged into a TAS 1010 VoiceBand Channel Simulator transmitted data while impairments were added to reproduce conditions found on average phone lines. In all tests, 100,000-byte files were transferred between each pair of modems. An ASCII file was used for the text file test. The spreadsheet benchmark used a *1-2-3* spreadsheet. The data base test was executed with a *dBASE III Plus* .DBF file. A TIFF (Tagged Image File Format) file was used in the TIFF benchmark, and the Program file transfer test compared transfers of a *Smartcom III* executable program.

Dirty Line
Two modems plugged into a TAS 1010 VoiceBand Channel Simulator transmitted data while impairments were added to reproduce conditions found on dirty phone lines. Modems were tested with various combinations of line impairments, including drop-off, white noise, and phase-shift jitter. Text transfer throughput matched average line throughput on all but the phase-shift–jitter test (line impaired by low-frequency phase jitter). This test used the same 100,000-byte ASCII file as the Average Line text file benchmark, but in this case the line was impaired with 15 degrees of 20-Hz phase jitter.

Data based on tests designed and conducted by National Software Testing Laboratories (NSTL). All rights reserved.

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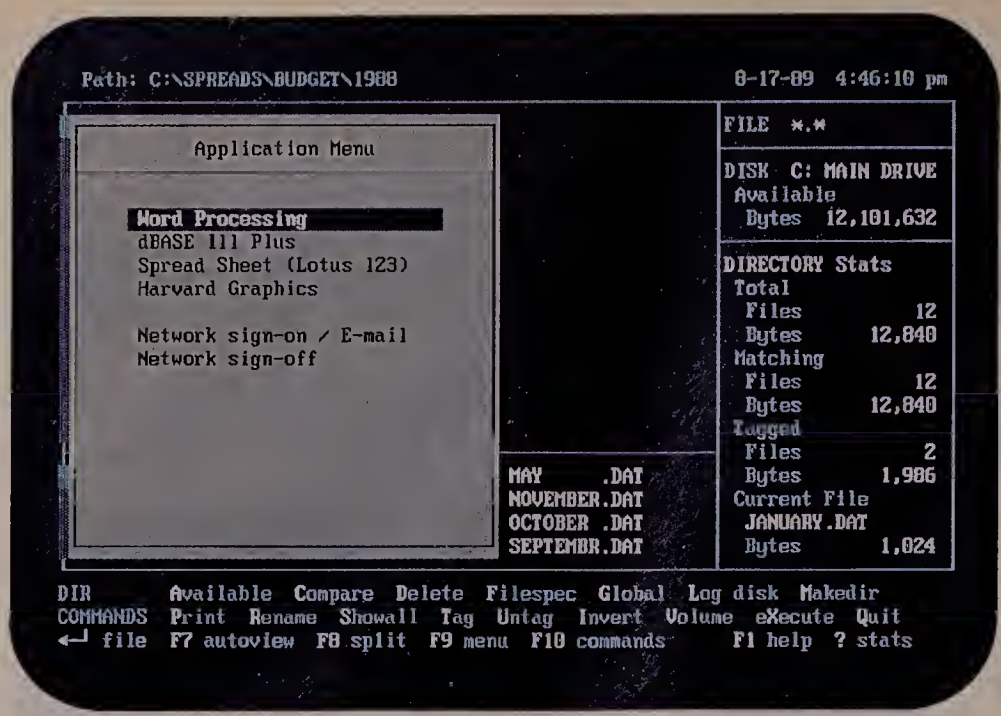
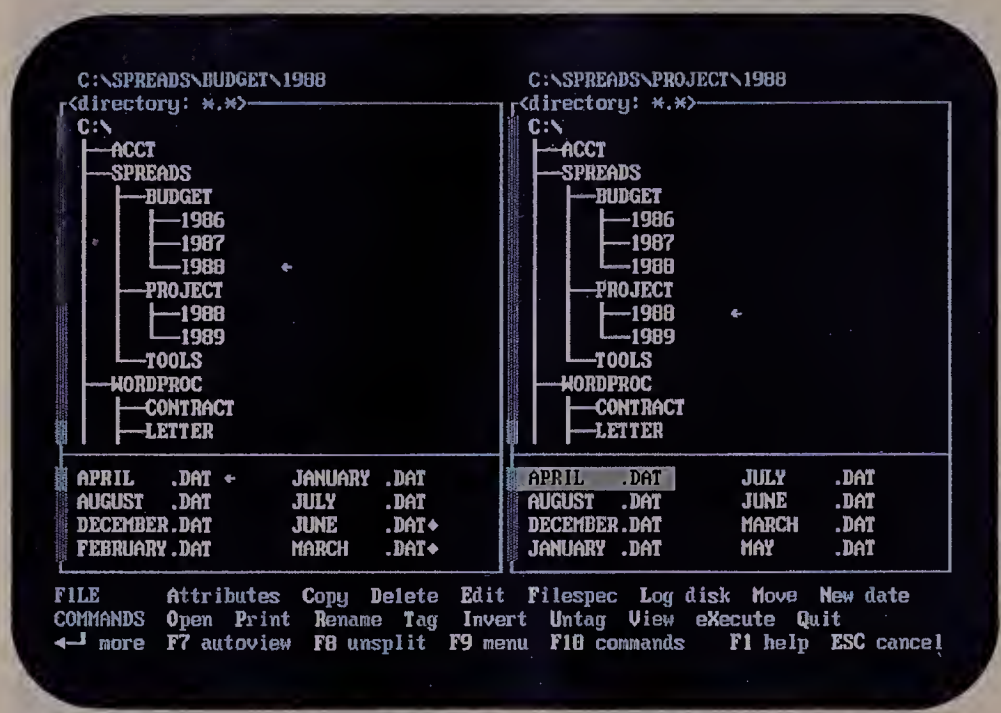
Circle 38 on reader service card



Application Menu—*Just point 'n shoot to run any application or commonly used procedure. MIS managers can easily create customized user environments.*



Split Windows—*Simultaneously view, compare and manipulate two separate directories or drives, and quickly locate files.*

AutoView—*Save time and guess-work by scrolling through file contents from the directory or file window.*

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Circle 340 on reader service card

and originate/answer switches and a screwdriver-adjustable speaker volume.

Hayes compatibility is top-notch, and the QX/V.32c also accepts Microcom's SX superset, but few packages support SX. A few software snags surfaced. The modem wouldn't tone-dial properly with *Smartcom III*, and it wouldn't work with *Lotus Express*.

The QX/V.32c is a racy modem with a racy price. It's highly recommended for high-volume buyers who need top speed.

Multi-Tech MultiModem V.32

The $1195 Multi-Tech MultiModem V.32 is the slowest modem in the roundup, and it suffers from more Hayes AT and software glitches than its rivals. Yet its speed is respectable, the compatibility glitches shouldn't prove serious for most users, and it offers a low price, a two-year warranty, and a high tolerance to jitter. Compared to non-V.32 modems, it might be a winner, but in present company, it's only a fair value.

The MultiModem excels at TIFF and binary transfers, but other files bog down. During phase-shift jitter tests, throughput dropped only 29 percent.

The MultiModem's thorough panel controls include switches for data rate, originate/answer, and voice/data. You also get a screwdriver-accessible volume control.

Don't expect to go on line without some tinkering. Special settings are required for *Crosstalk Mk.4*, *Smartcom III*, and *Hyper-Access*, and the manual offers no clues. For most setup chores, you flip easily accessed DIPs, but to change some functions, you must open the unit and wrangle with jumpers.

The MultiModem has one major Hayes AT incompatibility: The AT dial modifier won't wait 5 seconds before continuing to dial, making the modem unusable on some PABX systems. Also, you can't use the voice/data switch with *Lotus Express*.

Low price makes the MultiModem tempting, but other low-cost modems give you faster speed with fewer hassles.

EXECUTIVE SUMMARY

Multi-Tech MultiModem V.32

High-speed modem

The slowest modem in the roundup, the MultiModem V.32 con't quite keep up with the crowd. It requires speciol settings for most communications software, and it's unusoble with some PABX systems.

	POOR	FAIR	GOOD	EXCELLENT
Performance			●	
Software compatibility		●		
Hayes AT compatibility		●		
Setup and configuration	●			
Panel controls			●	
Overall value		●		

Reader service no. 602

EXECUTIVE SUMMARY

Racal-Vadic 9632VP

High-speed modem

Budget buyers will find the 9632VP oppealing. It provides good dato throughput and compatibility.

	POOR	FAIR	GOOD	EXCELLENT
Performance			●	
Software compatibility			●	
Hayes AT compatibility				●
Setup and configuration		●		
Panel controls				●
Overall value			●	

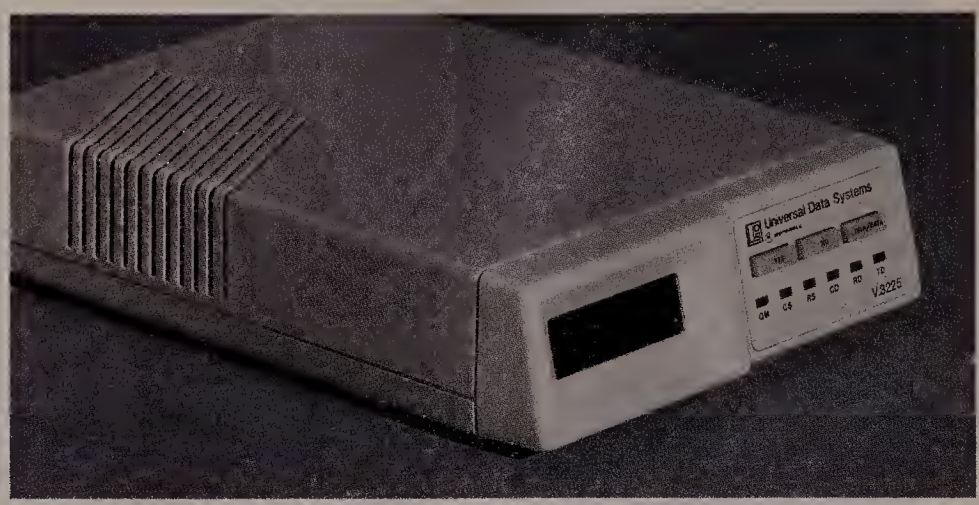
Reader service no. 603

Racal-Vadic 9632VP

The $1195 Racal-Vadic 9632VP delivers respectable speed at a low price; elaborate manual controls and a small footprint are other pluses. Despite a few software snags, it's a solid buy.

In speed the Racal-Vadic ranked in the middle of the three low-cost modems. TIFF and program files transferred slowly, but text transfers were speedy.

Who cares about the QX/V.32c's high $1799 price when you can blast text files at 33,333 bps?



The UDS V.3225 isn't the fastest modem around, but its 16,357-bps average speed, $1145 price, and perfect line-noise tolerance add up to a Best Buy.

PIERRE-YVES GOAVEC

To set up the modem, you enter parameters from the keyboard or press combinations of the five panel buttons, but the jargon-heavy manual makes these procedures confusing. The buttons double as switches for voice/data, originate/answer, speed, and diagnostics and synchronous modes.

In addition to supporting Hayes AT commands, the 9632VP offers its proprietary ATPlus set, but few packages support it. AT compatibility was perfect, but some software problems emerged. The speaker refused to turn off when switching from voice to data with *Smartcom III* and *HyperAccess*, and the modem randomly flipped between tone and pulse dialing with *Smartcom III*.

Despite a few software glitches, the Racal-Vadic 9632VP is a good value. But the UDS V.3225 is the better bargain.

Universal Data Systems V.3225

If you're on a budget, the Universal Data Systems V.3225 is the answer. At $1145, it's the cheapest modem in the roundup, and it's faster than the other low-cost units. Toss in perfect jitter tolerance and AT compatibility, and the UDS wins a Best Buy.

With an average speed of 16,357 bps, the UDS ranks third, offering the best price/performance ratio in the roundup. Several scores matched those of the second-place U.S. Robotics Courier, and the UDS never flinched when confronted with severe jitter.

In place of the usual LEDs, the UDS V.3225 sports a helpful LCD display that flashes status messages in plain English. The LCD also displays a rather cryptic menu to control its ROM-based setup. You'll need to refer to the manual while entering sequences with the three front-panel buttons. There are voice/data and power switches but no MI/MIC connection. Speaker volume is software controlled.

Hayes compatibility is superb. The UDS V.3225 has only one software glitch—it won't work with *Lotus Express*.

The UDS V.3225 delivers remarkable speed for a mere $1145. Unless you can afford the Microcom or the U.S. Robotics, the UDS is the way to go.

EXECUTIVE SUMMARY

Universal Data Systems V.3225

High-speed modem

BEST BUY

Coupling fast performance with a rock-bottom price, the UDS V.3225 also does the best job of weathering line impairments. Most users will find it their Best Buy.

	POOR	FAIR	GOOD	EXCELLENT
Performance			●	
Software compatibility			●	
Hayes AT compatibility				●
Setup and configuration		●		
Panel controls			●	
Overall value				●

Reader service no. 604

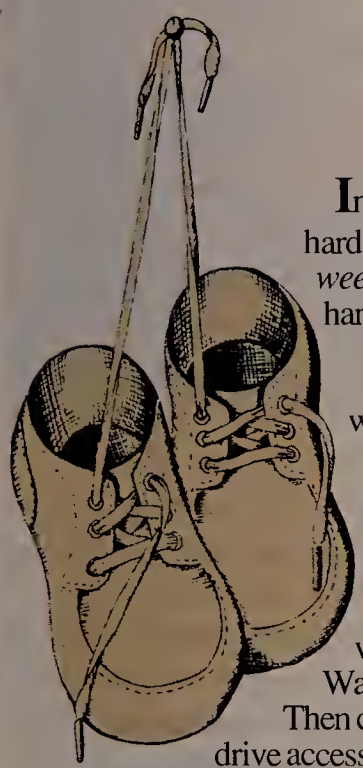
U.S. Robotics Courier HST Dual Standard

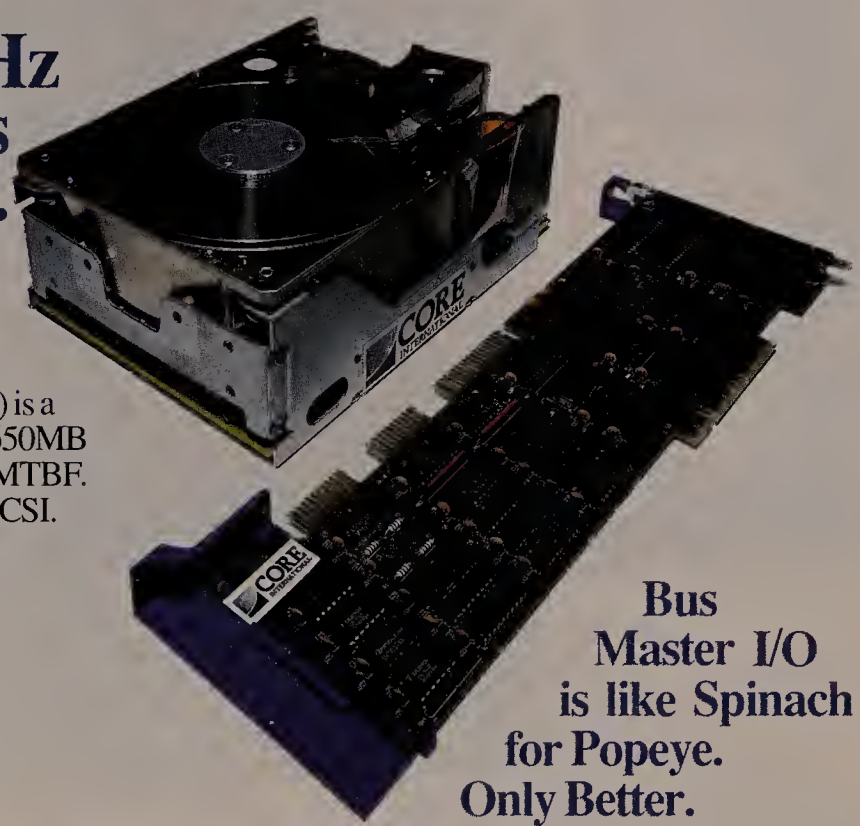
Flying along at 18,116 bps, U.S. Robotics' Courier HST Dual Standard is only slightly slower than the first-place Microcom QX/V.32c in MNP-5 mode—and at $1595, it's $204 cheaper. The modem's perfect AT and software compatibility scores, its compatibility with other Courier modems, and its two-year warranty add up to an excellent value.

By supporting the HST transfer protocol in addition to V.32, the Dual Standard is compatible with the company's $799 Courier HST, which has dominated the low end of the

Your newborn could be in first grade before our warranty runs out.

CORE 20MHz 650MB Drives 5 Year Warranty.





In an industry where the standard range for hard disk mean-time between failures (MTBF) is a *weenie* 25,000-40,000 hours, our HC Series 650MB hard files are rated at a *gonzo* 150,000 hours MTBF. They're available in 20MHz ESDI and SCSI. They carry a *full-replacement* 5 year warranty.

Yep. Five years.

Warp 4, Mr. Sulu.

First there was the XT with the world's slowest Hard Disk. Of course, we didn't know that then. To us it ran at Warp speed.

Then came the "class of 286" and CORE's drive access times smoked the capacity of the ST-506 controller— Warp 2.

So the industry brought forth a new interface to keep up with users' increasingly voracious appetite for accelerated I/O: ESDI.

Able to data transfer at 10 mega bits per second— twice that of the standard XT/AT controllers —Warp 3.

And just when you thought it was safe to specify 10Mhz ESDI drives and controllers, 386 AT-bus and Micro Channel desk rockets appear.

Their CPUs scream at 20, 25, even 33 MHz. Nice, but even 10MHz drives and controllers can't keep up.

So, we set out to build the next expression of high capacity & high speed mass storage devices.

The result is the 20MHz HC Series of superior hard disks and matching controllers —Warp 4.

Four times the data-bit transfer rate of the ST-506 XT/AT Controller, available in...

Four Fantastic Flavors.

CORE offers you a choice between ESDI or SCSI on the drive-to-controller interface, and AT-bus or Micro Channel on the controller-to-bus side.

Our advanced Bus Master controllers are available for Micro Channel or AT-bus.

All at Warp 4.

CORE INTERNATIONAL

7171 North Federal Highway • Boca Raton, Florida 33487

Bus Master I/O is like Spinach for Popeye. Only Better.

Remember? One 20 ounce can, a good squeeze, a big gulp, and Bluto was on his way to hyper-space.

Put a CORE Bus Master Controller in a PS/2 or AT-bus machine and watch the micro's performance leap, just like spinach does for Popeye's!

That's because CORE Bus Master Controllers carry their own intelligence, moving data between the drive and memory in *half* the clock cycles a standard controller takes.

At the same time the Bus Master frees the CPU to do other work.

Now add the 20MHz data transfer rate, and you'll get true balanced system performance.

And no empty spinach can to recycle.

Want Proof?

Call your CORE representative today for a FREE 8-page color brochure detailing information on our 20 MHz HC Series drives and controllers, how they max out I/O, and expand the available CPU clock cycles, especially on Micro Channel machines.

Find out how the CORE Bus Master Controller allows a 20Mhz CPU to perform like a 25.

Discover how our HC Series drives and Bus Master Controllers for the Micro Channel support full duplexing, making PS/2s a great choice for Novell 386 and v2.15 SFT.

All of the above.

They're simply another series of unique solutions from CORE. We're the folks who've been providing superior enhancements and upgrades for IBM computers since 1982.

Now, as an IBM business partner, we deliver on the Micro Channel promise, and keep the AT-bus out of extinction. Call today.

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Circle 254 on reader service card

EXECUTIVE SUMMARY

U.S. Robotics Courier HST Dual Standard

High-speed modem

The Courier is the second-fastest modem in the roundup, and its compatibility with popular communications packages and Hayes AT commands is superb. Its ability to link up with HST modems is another plus.

	POOR	FAIR	GOOD	EXCELLENT
Performance				●
Software compatibility				●
Hayes AT compatibility				●
Setup and configuration				●
Panel controls			●	
Overall value				●

Reader service no. 605

high-speed market and is especially popular on BBS's. U.S. Robotics also sells a $1495 Courier V.32, which lacks HST support but matches the Dual Standard's speed in V.32/MNP-5 mode.

Although it lacks Microcom's meteoric MNP-9 protocol, the Dual Standard almost beat the Microcom in MNP-5 mode, matching its speed at binary files and just missing with TIFF. In HST mode, the modem tested about 16 percent slower than in its V.32/MNP-5 mode.

The Courier offers the easiest setup process in the roundup. The DIP switches are easily accessible, and the manual is helpful. The stylish unit is devoid of controls except for a thumbwheel volume knob and an on/off switch. Also missing is an MI/MIC jack.

Superb speed and reliability make the Courier a stellar buy, especially if you need compatibility with both HST and V.32.

Now's the Time for V.32

Now that V.32's popularity ensures that you can put your modem's pedal to the metal in good company, you can safely move to high-speed communications. The Universal Data Systems V.3225 is a good place to start—its top-notch price/performance ratio makes it the Best Buy.

If you need lightning speed and plan to set up a corporate modem network, go with the pricey Microcom QX/V.32c. U.S. Robotics' Courier HST Dual Standard is another excellent value, especially if HST compatibility is key. Dropping down a notch, the Racal-Vadic 9632VP is a good buy. And despite the Multi-Tech MultiModem's last-place finish here, it would probably best most non-V.32 contenders.

No matter which V.32/MNP-5 modem you choose, you can be assured you'll have somebody to talk to. If you want to go high-speed, now's the time. ●

TJ Byers is a contributing editor for PC World.

For more information about all products in this article, circle reader service no. 901.

WHERE TO BUY

Microcom QX/V.32c
Microcom, Inc.
500 River Ridge Dr.
Norwood, MA 02062
800/822-8224,
617/551-1000
LIST PRICE: $1799
WARRANTY: one year parts and labor
EXTENDED WARRANTY: none
TECHNICAL SUPPORT: toll number, M–F 8–7
OTHER SUPPORT: none
Reader service no. 601

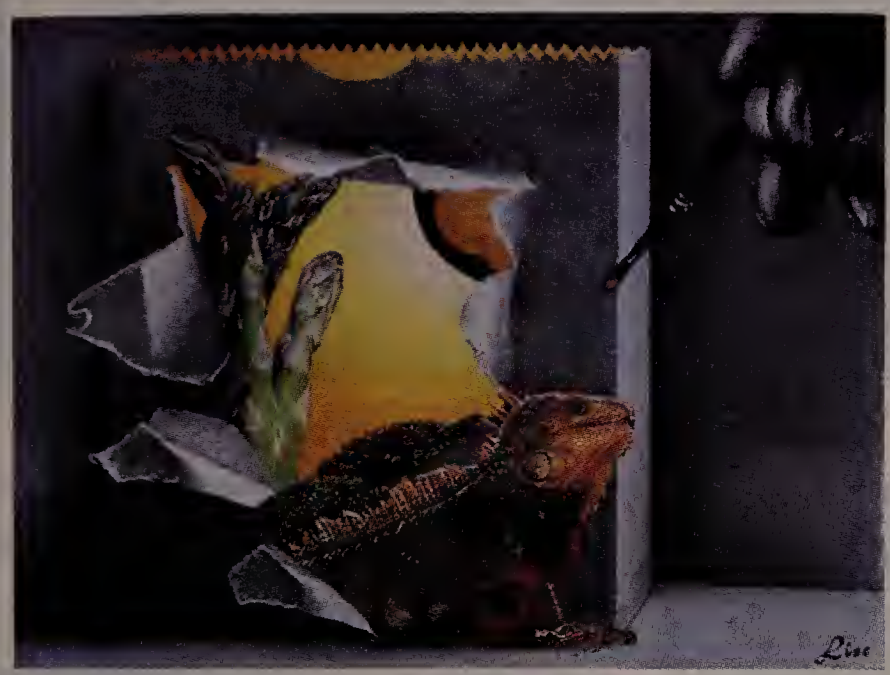
MultiModem V.32
Multi-Tech Systems, Inc.
2205 Woodale Dr.
Maunds View, MN
55112
800/328-9717
LIST PRICE: $1195
WARRANTY: two years parts and labor
EXTENDED WARRANTY: none
TECHNICAL SUPPORT: toll-free number, M–F 8:30–5
OTHER SUPPORT: BBS
Reader service no. 602

Racal-Vadic 9632VP
Racal-Vadic
1708 McCarthy Blvd.
Milpitas, CA 95035
408/432-8008
LIST PRICE: $1195
WARRANTY: one year parts and labor
EXTENDED WARRANTY: none
TECHNICAL SUPPORT: toll-free number, M–F 7:30–4:30
OTHER SUPPORT: BBS on CONNECT
Reader service no. 603

UDS V.3225
Universal Data Systems
5000 Bradford Dr.
Huntsville, AL 35805
800/451-2369,
205/721-8000
LIST PRICE: $1145
WARRANTY: one year parts and labor
EXTENDED WARRANTY: none
TECHNICAL SUPPORT: toll-free number, M–F 7–6
OTHER SUPPORT: none
Reader service no. 604

U.S. Robotics Courier HST Dual Standard
U.S. Robotics, Inc.
8100 N. McCormick Blvd.
Skokie, IL 60076
800/342-5877,
312/982-5001
LIST PRICE: $1595
WARRANTY: two years parts and labor
EXTENDED WARRANTY: $20.50 per year
TECHNICAL SUPPORT: toll-free number, M–F 9–5
OTHER SUPPORT: BBS
Reader service no. 605

PC Paintbrush IV Plus



Now you can scan, create, edit and dramatically enhance images. All with one program: the new PC Paintbrush IV Plus.™ It brings you all the power of ZSoft's PC Paintbrush IV™ – and builds in complete scanner control, large image support and other powerful pluses.

Dress up your documents and presentations with gradient color backgrounds, impressive text effects, and automatic patterns.

Scanning power.

Control your scanner from *within* PC Paintbrush IV Plus. Scan and edit full-page, black-and-white, gray-scale and color images with a 640K system. Rescale images (25 to 400 percent). And with the unique pre-scan feature, simply frame the precise area you want, then scan *only* that area at high resolution.

Image enhancement.

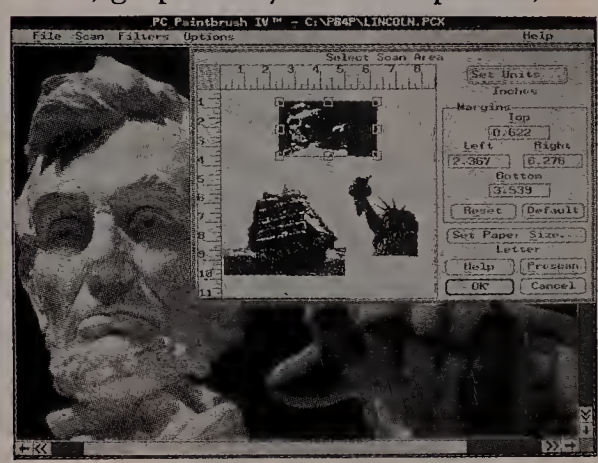
The new PC Paintbrush IV Plus is packed with innovations. New retouching features let you blend, lighten, darken, adjust contrast, change tints and blur portions of any image. New image processing functions let you automatically correct poor originals. It's like having a photo lab in your computer!

Persuasive presentations.

For compelling overheads, slides and documents, choose from a huge arsenal of features. For example, use the "tiling" feature to create 3-D effects and intricate textures. Automatically shadow, outline and graduate text for dynamic effects. Load and save PCX and TIFF images. Capture screens. You can even overlay two images.

Intuitive interface.

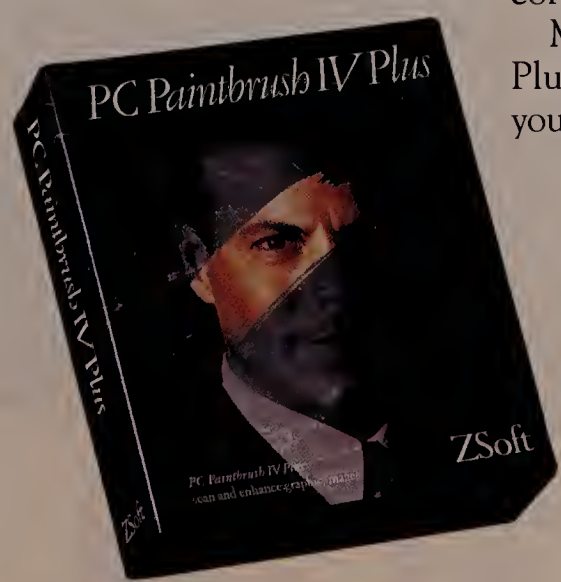
PC Paintbrush IV Plus is packed with convenience: Pull-down menus, customizable screen layouts, graphically labeled options,



Complete control of your scanner. . . select resolution, halftone pattern, brightness, contrast and rescale from 25 to 400 percent.

multiple levels of context-sensitive help, and a combination of mouse control and keyboard accelerators.

Move up to PC Paintbrush IV Plus. It's the perfect finish to what your scanner started.



ZSoft
CORPORATION

450 Franklin Road / Suite 100
Marietta, Georgia 30067
(404) 428-0008
FAX: (404) 427-1150

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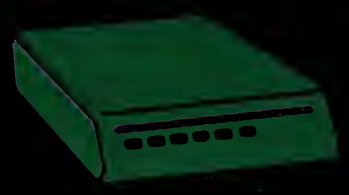
Circle 206 on reader service card

THE 386 SERIES

PRINTERS

MONITORS



MODEMS

LAP TOP

NETWORKING

THE

HEAVYWEIGHT. REAL MUSCLE. THE HYUNDAI SUPER-386c:80386 PROCESSOR, 8/20 MHz, 1MB RAM INSTALLED EXPANDABLE TO EIGHT MB, 64 KB ROM, SPACE FOR 4 HALF-HEIGHT DISK DRIVES: 5.25" OR 3.5", SIX EXPANSION SLOTS. MS-DOS 3.3, BASIC. OS/2 COMPATIBLE. 18-MONTH WARRANTY. 24-HOUR "SERVICE-ON-SITE" OPTION. NATIONWIDE NETWORK OF DEALERS.

SMART MOVE. ANYTIME, ANYWHERE. THE HYUNDAI SUPER-LT3: 80C286 PROCESSOR, 8/10MHz, 1MB RAM, 64 KB ROM, SUPER TWIST LCD SCREEN, SERIAL AND PARALLEL PORTS, RGB COMPOSITE PORT, 3.5", 1.44 MB FDD, 20 MB LOW POWER HDD. AC ADAPTOR, RECHARGEABLE INTERNAL POWER PACK. CARRY CASE. APPROX. 12 LBS. WEIGHT. (WITH BATTERY). 18-MONTH WARRANTY.

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WORKHORSE. HOW TO HARNESS ALL THE POWER YOU NEED. THE HYUNDAI SUPER-286E: 80286 PROCESSOR, 12 MHz, 640 KB RAM, SPACE FOR THREE DRIVES: 5.25" OR 3.5", SIX EXPANSION SLOTS. WITH MS-DOS 3.3, BASIC. 18-MONTH WARRANTY. NATIONWIDE NETWORK OF DEALERS. 24-HOUR "SERVICE-ON-SITE" OPTION.

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FAMILY

THE 20 MHz SUPER 386c

THE 10 MHz SUPER LT3

THE 12MHz AT SUPER-286E

THE 10 MHz XT SUPER-16TE

Get Practical. Get Hyundai.

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HYUNDAI

Circle 113 on reader service card

MARK MAREK

A GRAB BAG OF GAMES FOR THE HOLIDAYS

Take a break from boring business applications and tackle a real PC challenge. With their hot graphics and complex play, these games will push you and your PC to the limit.

If you're like most PC users, you've got a lot of high-powered hardware sitting on your desk. Why are you wasting it on work? Endowed with high-resolution graphics and multiple levels of play, games have become as powerful and sophisticated as today's top business applications. Think that 3-D spreadsheet is impressive? Take a walk through the full-screen, multidimensional graphics of Sierra's *Space Quest III*. Still trying to hitch a graphical front end to your relational data base? The map-based interface of Mindscape's *Balance of Power: 1990* serves up reams of data at the click of a mouse.

We've smoked out more than two dozen of the year's hottest releases in five categories: adventure/role playing, vehicle simulation, sports simulation, parlor classics, and arcade emulations. For a few hours you can be president of the United States or the pilot of an interstellar spaceship, trade pawns with a grand master, or escape the desktop doldrums with an arcade simulation.

Of course, it's not always fun and games. Flight simulators and chess programs have proven effective learning tools. And Springboard Software reports that its real-world political simulation *Hidden Agenda* is being used as a training program by the U.S. State Department.

Almost all the games in this Buyers' Guide support mice and joysticks as well as keyboards. Copy protection is common but comes mainly in the less noxious forms of code wheels and key disks, which allow most games to be installed on a hard disk. And though most games are strictly a solitary pleasure, some can handle four players at once, and two offer options for long-distance play by modem.

Whether you use them as practical learning tools or stress relievers, you'll find games here that will push you *and* your machine to the limit. But enough preamble: Let the games begin.

MATT LAKE AND DANIEL TYNAN

ADVENTURE/ ROLE PLAYING

Balance of Power: The 1990 Edition
Mindscape

Balance of Power: 1990 is a chilling exercise in realpolitik: As U.S (or Soviet) president, your goal is to dominate the world without blowing it up. The game screen is a color-coded world map; just click on a country and pull down a menu to sign treaties, destabilize governments, or prop up crumbling regimes. The new *Windows*-based edition adds a Multipolar option that allows minor countries to fight wars and influence events. But power has its price: You'll need 640K of RAM and 2MB of hard disk space, and a fast CPU is recommended. CGA, EGA, MCGA. List price: $49.95, run-time *Windows* $15.

Reader service no. 610

Hidden Agenda
Springboard Software

The fascist dictator of Chimerica has just been overthrown. As the new leader, you have three years to appease the peasants, defang the military, and restore the country to order. But be careful—menu-based *Hidden Agenda* is full of Hobson's choices and no-win situations. In fact, the only things that are black-and-white in this game are its graphics, which are limited to digitized photos. CGA. List price: $59.95.

Reader service no. 611

J. R. R. Tolkien's War in Middle Earth
Melbourne House

This dynamic version of Tolkien's famous trilogy features full-screen digitized graphics and three levels of magnification. From the Map level you can view all of Middle Earth, zoom down to Campaign level to see flashing character icons scuttle across the landscape, then zoom again to watch Frodo and his friends battle the evil Nazgul Lords. Warning: Graphics this intense could be Hobbit-forming. CGA, EGA, MCGA, VGA. List price: $49.99.

Reader service no. 612

Space Quest III
Sierra On-Line

The further adventures of Roger Wilco, intergalactic garbageman. As Wilco, your job is to save the Two Guys From Andromeda from the evil Pirates of Pestulon. Lush 3-D graphics allow you to move Wilco around, behind, and inside on-screen objects. In addition to wry humor, this "interactive movie" features a musical sound track by Supertramp member Bob Siebenberg. CGA, EGA, MCGA, VGA. List price: $59.95.

Reader service no. 613

Where in Time Is Carmen Sandiego?
Brøderbund Software

The third installment in this enormously popular series finds you tracking the slippery Carmen Sandiego and her band of silly thugs through 1500 years of civilization. You'll leap between 48 locations in time and space, deciphering clues with the help of the game's 1400-page desk encyclopedia. Designed for sleuths age 10 and up, *Carmen Sandiego* offers an engaging way to learn basic research skills. Special school editions offer Teachers' Guides and extra disks. Requires dual-floppy or hard disk system, key disk. CGA, EGA, MCGA, VGA. List price: $44.95, School Edition $54.95, Lab Pack $109.95.

Reader service no. 614

VEHICLE SIMULATION

688 Attack Sub
Electronic Arts

688 Attack Sub takes you to the depths of sub culture. As captain, you control the vessel's speed, navigation, sonar, weaponry, and periscope. You must complete ten missions, outdueling the enemy in a cunning game of subterfuge. A modem option lets you play head-to-head with other *Attack Sub*-mariners. EGA, VGA. List price: $49.95.

Reader service no. 615

Chuck Yeager's Advanced Flight Trainer 2.0
Electronic Arts

Running *Advanced Flight Trainer* is like having Chuck Yeager strapped into the cockpit beside you. In addition to 14 planes and eight views, you get a detailed analysis of each session and an audiocassette full of General Yeager's anecdotes and advice. You can do Cuban 8s, formation flying, and aileron rolls—and if you fly too fast, a red film fades into the screen in a disturbing simulation of passing out. CGA, EGA, VGA. List price: $49.95.

Reader service no. 616

Dolphin Sailing Simulator, Dolphin Boating Simulator
Dolphin Marine Systems

If you've ever harbored a love of ships, Dolphin's realistic simulations are for you. They offer multiple views, different sea and weather conditions, and full control of a range of vessels. Armchair Sinbads can get their feet wet—coordinating engines, trim, rudder, and sails—without getting in over their head. Both products come with a Chesapeake Bay course; six other voyage disks are available. CGA, EGA,

Balance of Power: 1990 uses the Windows interface as the forum for a game of global politics.

The periscope is only one of the functions you control in 688 Attack Sub as you guide your submarine into the combat zone.

VGA. List price: $49.95, extra voyage disks $24.95 each.

Reader service no. 617

The Duel: Test Drive II
Accolade

Like the movies, popular games are spawning sequels. But unlike most film sequels, *The Duel: Test Drive II* improves on the original. This time you choose either a Ferrari F40 or Porsche 959, then race head-to-head against the computer and the clock. Four optional disks let you slalom down the California coast or sprint across Europe; you can also add classic sixties muscle cars or sleek late-eighties speedsters. Requires key disk. CGA, EGA. List price: $44.95, extra car and scenery disks $19.95 each.

Reader service no. 618

Echelon
Access Software

Ferraris and fighter jets too slow for you? Take a spin in the C-104, the twenty-first century's most advanced space vessel. *Echelon* mixes elements of space adventure, mystery story, and shoot-'em-up arcade games—but first you must master the C-104's many controls. The game employs Access's Real Sound feature, which enhances the game with gentle music, voices, and realistic sound effects—but also requires a hefty chunk (2MB) of your hard disk. CGA, EGA, VGA. List price: $59.95.

Reader service no. 619

Flight Simulator 4.0
Microsoft

The latest upgrade to the ever-popular *Flight Simulator* adds random weather patterns and a facility for designing and flying your own planes. The views of the action—already worthy of Spielberg—now include other planes and moving trucks. Additional scenery disks from SubLogic give you more than 100 airports to fly from. You can even link up with a friend by modem and fly wing to wing. EGA, VGA; 1 or 2 players. List price: $59.95, additional scenery disks $24.95 to $29.95 each.

Reader service no. 620

Steel Thunder
Accolade

Steel Thunder puts you inside a tank—and it can be a rough ride. As both driver and gunner, you're given ten missions in which to hunt down and destroy your enemies, which is not as easy as it sounds. Controlling the vehicle uses most of the keyboard; fortunately, Accolade provides a command template. CGA, EGA, MCGA, VGA. List price: $39.95.

Reader service no. 621

SPORTS SIMULATION

Earl Weaver Baseball 1.5
Electronic Arts

Earl Weaver Baseball provides everything but the hot dogs and the beer. A quick-action version puts you right into the batter's box; after your rookie season, a manager's version lets you move into the dugout to match wits with the Earl of Baltimore. You can trade players, create dream teams, build customized rotisserie leagues, and more. Impressive split-screen graphics offer TV-style views of the pitcher and batter. CGA, EGA; 1 or 2 players. List price: $39.95, 1988 statistics and Commissioner's disks $19.95 each.

Reader service no. 622

Five on Five: Lakers vs. Celtics
Electronic Arts

NBA-licensed *Five on Five* brings full-team roundball to the PC gym. Ten teams from the 1987–88 season are included, complete with players' trademark moves. Watch Kareem loft a skyhook or Air Jordan swoop to the hoop for a monster jam. But be sure to give your stars some time on the pine—fatigue and injury factors are built in. CGA, EGA; 1 or 2 players. List price: $49.95.

Reader service no. 623

Hole-in-One Miniature Golf
DigiTek

You want windmills? *Hole-in-One* gives you alien moonscapes and Godzilla gnawing on a skyscraper. Its 90 holes range from a fantasy course to Expert Challenge—a mine field of mazes and water hazards. It even sports a realistic boss-key

Earl Weaver Baseball puts you behind the plate, with split-screen views of the batter, the pitcher, and the base runners.

screen—ideal for those who like to putter around the office. CGA, EGA, MCGA, VGA; 1 to 4 players. List price: $34.95, additional course disk (54 holes) $19.95.

Reader service no. 624

Jack Nicklaus' Greatest 18
Accolade

Jack Nicklaus' Greatest 18 is like the real thing but with better graphics: You can follow the shadow of the ball as it arcs over the fairway, bounces off a tree, and splashes into a water hazard. Choose normal stroke play or Skins, where you play head-to-head against three opponents (computerized or human). New for 1989: three grand-slam courses from the recent pro tour; an additional disk supplies the missing links. CGA, EGA; 1 to 4 players. List price: $49.95, course disk $19.95.

Reader service no. 625

John Madden's Pro Football
Electronic Arts

Ex-coach John Madden bursts onto the electronic gridiron with a game modeled after his own pigskin philosophies. As with *Earl Weaver*, you can choose between simple Action and more complex Strategic versions; the latter offers 162 offensive and defensive plays. The Madden Report lets you view one-on-one player matchups, while the Chalkboard allows you to edit existing plays or create your own, then—BOOM—run them against a sample defense. CGA, EGA; 1 or 2 players. List price: $49.95, 1987–88 statistics disk $24.95.

Reader service no. 626

Speedball 1.0
Cinemaware

Speedball combines pinball and hockey with treachery and brute force. The object is to hurl a metallic ball so that it ricochets off obstacles and into your opponents' goal. You select a team of five grossly outsize players and attempt to claw your way to the top of an 11-team league. When speed, skill, and stamina aren't enough, the game lets you bribe the officials. CGA, EGA; 1 or 2 players. List price: $39.95.

Reader service no. 627

PARLOR CLASSICS

Fidelity Chessmaster 2100
The Software Toolworks

Master-rated by the U.S. Chess Federation, *Chessmaster 2100* is challenging at all levels of skill. The game offers both overhead and 3-D views as well as prolific hints, analyses, and teaching aids—plus a library of opening moves and championship games. CGA, EGA, VGA. List price: $49.95.

Reader service no. 628

Gin King, Cribbage King
The Software Toolworks

Two games for the price of one, *Gin King* and *Cribbage King* offer expert advice and instant scoring for new players, flexibility and an attractive screen for old hands, and a choice of computerized opponents. A miniature deck of cards and cribbage board are included in the box. EGA, VGA. List price: $59.95.

Reader service no. 629

Gin King, Cribbage King lets you sharpen your card skills against seven computer opponents.

Mah Jongg 3.1
Nels Anderson

A relaxing and beautifully rendered solo version of the ancient game, Nels Anderson's *Mah Jongg* has advantages over the real thing. The tiles come ready-stacked, you can get help when you're stuck, and you can undo your last move without any protest. Because it's shareware, it's also considerably cheaper than a set of ivory tiles. EGA. List price: $10.

Reader service no. 630

Nemesis Go Master 4.0
Toyogo

If chess is the game of war, go—the 4000-year-old Japanese tactical challenge—is the game of market strategy. *Nemesis Go Master* offers an excellent introduction: Your computer opponent will win but won't gloat. Optional advice for novices and additional tutor and tactical modules round out the training. CGA, EGA, VGA. List price: $79, Joseki Tutor $49, Tactical Wizard $59.

Reader service no. 631

Sargon IV
Spinnaker Entertainment Group

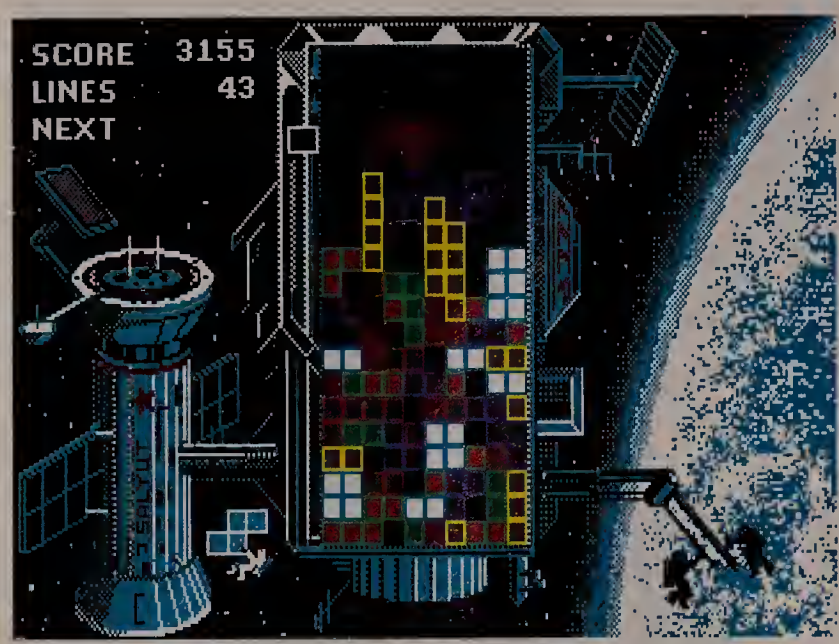
The latest version of the chess classic *Sargon* plays a strong game at all 16 skill levels, offering help and tutorials along the way. You even get to read your opponent's mind: *Sargon IV* offers a window into the program's tactics. For variety, you can choose different chess sets or design your own. EGA, VGA. List price: $49.95.

Reader service no. 632

Windows Backgammon Deluxe
E. F. Dickey

An attractive simulation of the board game, *Backgammon Deluxe* takes full advantage of the *Windows* interface. Variant games Acey Deucey and Dutch Backgammon are also included. If you're someone who hates to lose to machines, take note: The program can be beaten. Requires *Windows*. EGA, VGA; 1 or 2 players. List price: $29.95.

Reader service no. 633



Tetris is a simple but compelling arcade game with a range of attractive backdrops.

ARCADE EMULATIONS

Arkanoid II—Revenge of Doh
Taito

In this sequel to the arcade classic, the colorful screens and fast-paced action continue as you deflect energy balls to destroy blocks and clear the screen. A slew of power blocks improves your chances of ascending all 67 game levels to face off against the evil alien Doh. The game's biggest plus is a construction set for building your own screens. Requires key disk. EGA, VGA. List price: $34.95.

Reader service no. 634

Beyond the Black Hole
The Software Toolworks

Billed as a 3-D space adventure, *Black Hole* remains absorbing long after you've thrown away the cardboard 3-D glasses. You use a circling orb to knock galactic junk—including bells, pool balls, and bubbles—into hyperspace. Refueling also takes skill, and as you get beyond the initial stages, you find yourself falling into—and trying to escape—a black hole. CGA, EGA, VGA. List price: $49.95.

Reader service no. 635

Tetris 1.1
Spectrum Holobyte

A far cry from most shoot-'em-up arcade fare, *Tetris* is a compelling, geometrically oriented game developed in the Soviet Union. As random shapes fall into view, you rotate and shift them to fill the screen with the fewest possible gaps. Ten progressively harder levels—each displayed against a different Russian locale—provide grist for experienced players, and a new TSR option makes it easy to sneak in a quick game at work. CGA, EGA. List price: $34.95.

Reader service no. 636

Time Bandit
MichTron

Time Bandit lets you steer your hero through an underground maze containing 16 different games. Some bear a more-than-passing resemblance to such arcade classics as *Pac-Man* and *Rogue*, while others offer the more taxing elements of text-based adventures. *Time Bandit* also measures your level of skill and daring. CGA, EGA, VGA. List price: $39.95.

Reader service no. 637

Matt Lake is an editorial assistant and Daniel Tynan is an assistant editor for PC World. ●

For more information about all products in this article, circle reader service no. 902.

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DigiTek Software
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Tampa, FL 33614
813/933-8023

Dolphin Marine Systems
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Dawningtown, PA 19335
800/367-3622,
215/269-6800

Electronic Arts
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San Matea, CA 94404
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Melbourne House
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Irvine, CA 92714
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MichTron
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313/334-3553 (fax)

Microsoft Corp.
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Redmand, WA
98073-9717
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Mindscape
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Narthbraak, IL 60062
312/480-7667,
312/480-1948 (arders)

Nels Anderson
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Framingham, MA 01701
617/449-7322 (BBS),
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Sierra On-Line
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Caarsegald, CA 93614
209/683-4468

The Software Toolworks
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Chatswarth, CA 91311
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Spectrum Holobyte
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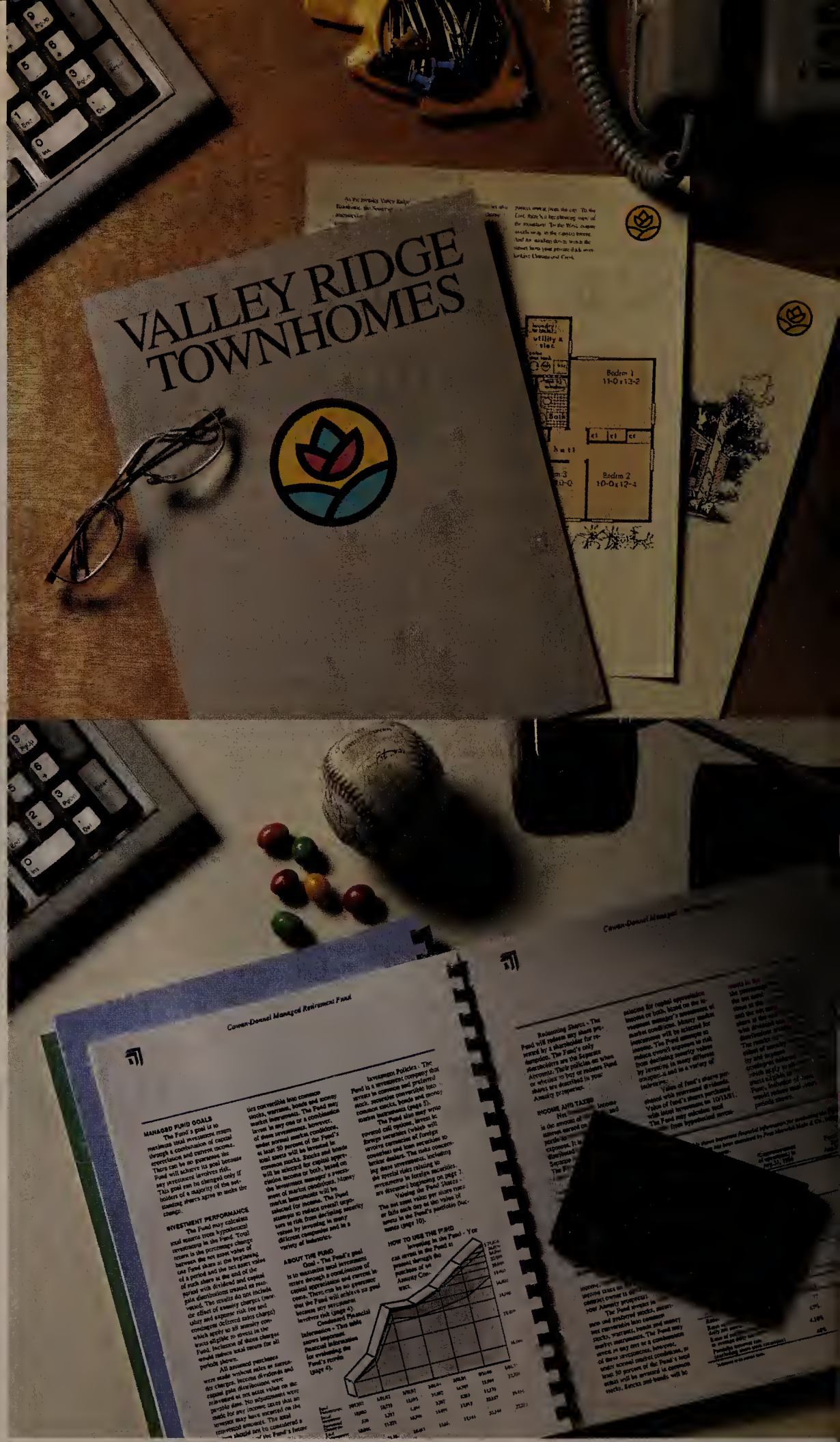

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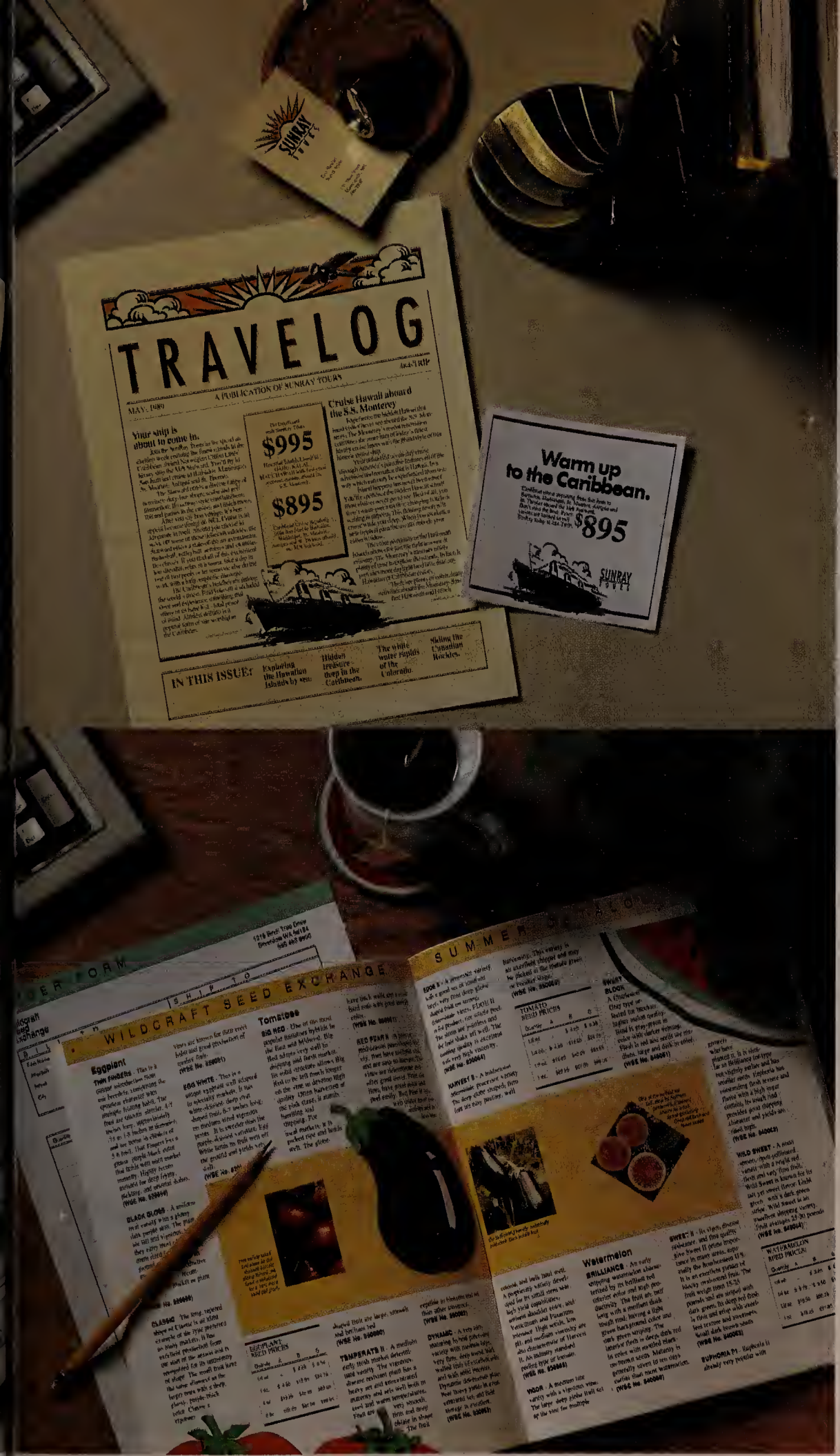

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MARK JOHANN

SMALL WONDERS

THEY DON'T HAVE THE PUNCH—OR THE PRICE TAG—OF A PC. BUT IF YOUR ADDRESS BOOK IS BULGING AT THE SEAMS, ONE OF THESE FEATHER-WEIGHT ELECTRONIC ORGANIZERS MAY BE JUST RIGHT FOR YOU.

William Rodarmor

Designed for business travelers and gadget lovers, electronic organizers promise to be this year's favorite stocking stuffers. Ranging in price from $260 to $400, such devices as the Casio BOSS, the Sharp Wizard, the Psion Organizer, and the Atari Portfolio provide stripped-down ROM-based utilities designed to ease life on the road. Most include a calendar, a scheduler, a memo pad, a calculator, and a world clock as well as searchable phone and

address books. Cable and software links let you swap data such as expense records with another hand-held, a PC, or a Macintosh. And except for the BOSS, the machines accept credit card–size ROM and RAM cards, so you can run optional software (when available) or add memory.

Palm-top computers will appeal to people who need reference data at their fingertips. A sales manager in a store, for instance, can use one to access price, warranty, and discount data on hundreds of items instantly. And some interesting software is beginning to appear. For example, you can enter the hours you spend with clients into a Wizard, then upload the data to North Edge Software's *Timeslips III* time-and-billing program.

Alas, the hand-helds reviewed here suffer variously from small screens, non-QWERTY keyboards, and counterintuitive commands. The BOSS and the Wizard are basically electronic versions of the Day-Timer—handier, if somewhat harder to use—while Psion's Organizer suffers from awkward design. Only Atari's new Portfolio promises to deliver serious computing power.

BRINGING THE BOSS HOME

Casio's BOSS (it stands for Business Organizer Scheduling System) is slim enough to fit in a shirt pocket and boasts a raised 81-key QWERTY (typewriter-style) keyboard. But it's a closed system, the only hand-held in this roundup without a slot for extra RAM or software cards. You can punch in and transfer data, but beyond that you're limited to the BOSS's built-in applications.

The 8.5-ounce SF-8000 model we saw has 64K of RAM and lists for about $260. Its LCD display is easy to read, and the keyboard is far more convenient than the ABC keyboards of the Wizard and the Organizer.

The BOSS's ROM-based functions include a phone list, a memo pad, a name-and-address file, a calendar, a scheduler with multiple alarms, and a world clock. The layout of the BOSS's two-month calendar and bar-chart scheduler makes them easier to read than most, and you can set multiple alarms in the scheduler. The BOSS includes a free cable to let you import or export data, such as the *Official Airline Guides*' data base of restaurants in major cities; however, you'll also need Traveling Software's $110 *BOSS PC-Link* program.

Despite some clever features, the BOSS is limited as a computing tool. It may help you find sushi on the Lower East Side, but it can't run a spreadsheet.

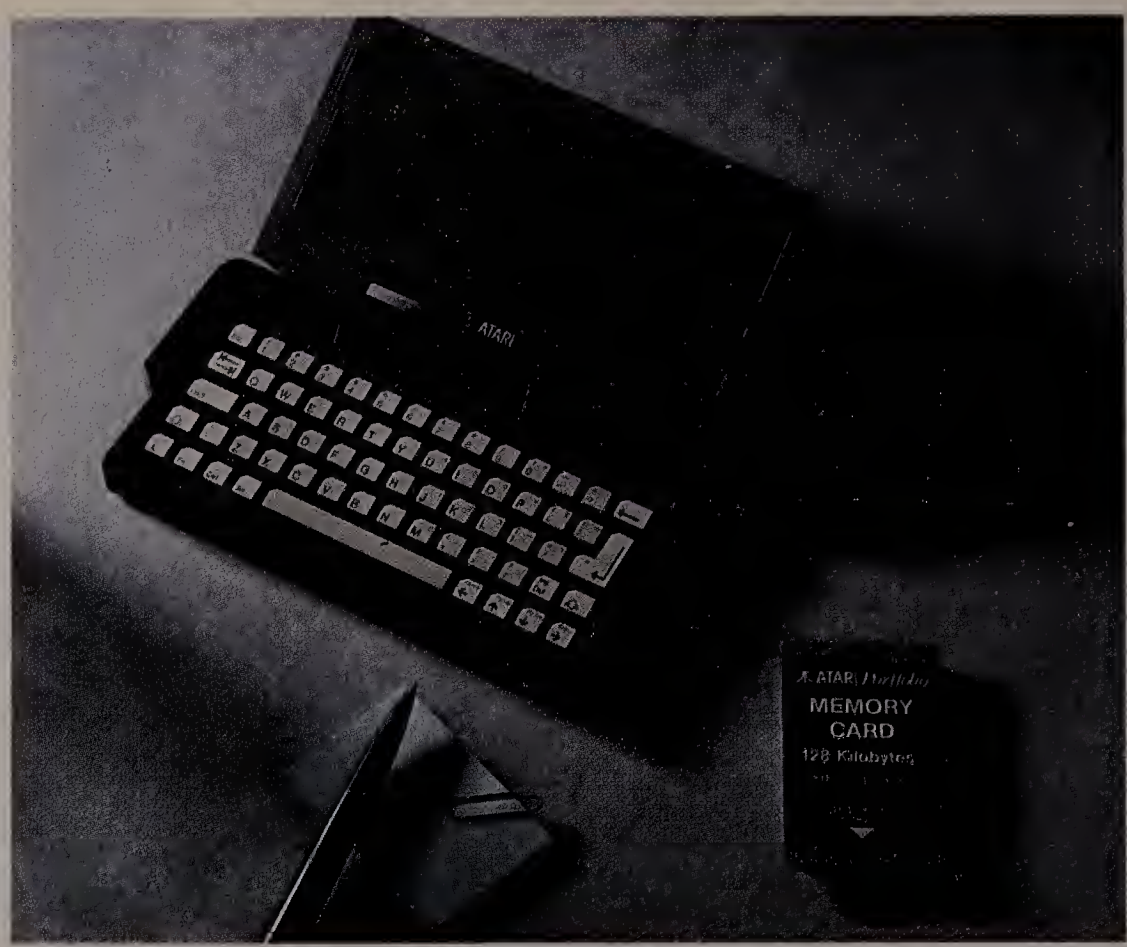
A SHARP BIT OF WIZARDRY

A direct competitor of the BOSS, Sharp Electronics' $299 Wizard suffers from a smaller screen and a non-QWERTY keyboard, but it has the big advantage of accepting RAM and software cards. At press time, Sharp had announced plans to ship a *1-2-3*–compatible spreadsheet, modem software, and city information files—all on ROM cards.

The Wizard OZ-7000 we saw opens like a book; you can hold it in one hand and punch keys with the other. This is just as well, since the Wizard's 73-key ABC keyboard gives new meaning to the phrase *hunt and peck*. (Fortunately, it includes a separate numeric keypad.) The 8-ounce machine comes with 32K of RAM—enough for some 700 names and numbers or 440 schedules—and memory can be expanded to 96K.

The Wizard's 128K of ROM-based software includes a scheduler, a memo pad, a calculator, a phone list, a clock, and a 200-year calendar. An optional software card gives you a to-do list, a time-and-expense manager, a thesaurus/dictionary, and a primitive eight-language translator. Transferring data to or from a PC is pretty simple: You plug in a $30 serial cable, then run Traveling Software's $150 *Wizard*

YOU CAN ACTUALLY TYPE ON THE CASIO BOSS'S MINI-KEYBOARD, BUT THE WIZARD AND THE PSION ORGANIZER ARE STRICTLY HAND-HELD NOTE TAKERS (FAR LEFT).



MARK JOHANN

THE SIZE OF A VCR TAPE, ATARI'S PORTFOLIO PACKS A BUILT-IN SPREADSHEET AND WORD PROCESSOR PLUS A READABLE 40-BY-8-CHARACTER DISPLAY.

PC-Link program on the PC.

The Wizard is a handy little gadget, and it will grow in usefulness as software is developed for it. But this holiday season it may pay to wait: Sharp is working on an advanced Wizard with a QWERTY keyboard, a fax link, and infrared communication with your PC.

LABOR ORGANIZER

Psion's $299 Organizer II LZ is bulkier than the BOSS, its 36-key ABC keyboard is smaller than the Wizard's, and it has the tiniest screen of the machines reviewed. Despite all this, the Organizer is still one step up the hand-held ladder. Where the BOSS lacks an I/O slot and the Wizard is short on software, the Organizer offers a solid set of built-in applications, easy expandability, and a catalog of programs you can buy today—including a 99-row-by-26-column spreadsheet and a nifty Travel Pack that figures time and currency conversions and logs your expenses and itinerary.

The Organizer II LZ model we looked at comes with 32K of RAM (expandable to 288K) and 64K of ROM applications. Two thumb-size slots in the back accept EPROM cards. The Organizer's serial port lets you transfer data to a PC, a modem, or a bar-code reader.

The Organizer's functions include an address book, a memo pad with cut-and-paste, a world clock, a scientific calculator, a diary, a monthly calendar, and eight independent alarm clocks. But what makes the Organizer unusual is its BASIC-like programming language, which you can use to create a phone list or a mortgage template. With a slew of optional ready-to-run programs, the Organizer is the best-supported hand-held in the group. It's too bad the machine's awkward keyboard and small screen will limit its following.

ARTISTIC PORTFOLIO

The heaviest of the hand-helds, Atari's $400 Portfolio comes closest to being a true computer. Encased in suede-textured plastic, the preproduction model we saw was the size of a VCR tape and weighed just under a pound. Thanks to its built-in spreadsheet and word processor, the Portfolio lets users run "what if" scenarios during sales meetings, take notes in college classes, and check inventory from the shop floor.

The Portfolio is a 4.92-MHz machine with 128K of RAM. It's DOS compatible in the sense that it will run DOS applications that have been rewritten for a 40-character screen. The Portfolio's memory can be significantly expanded to 640K, though at a price. It has a very readable black-on-white LCD display (40 columns by 8 lines)—the largest display of any machine here. A nifty bonus: The Portfolio boasts a speaker that can auto-dial phone numbers by beeping them into the handset.

The Portfolio's built-in applications include a 128-row-by-256-column spreadsheet that reads and writes .WKS (but not .WK1) files, a basic word processor, an appointment calendar with alarms, a phone directory, and a calculator. Moreover, a number of major vendors are writing ROM versions of their software for the machine. At press time, Atari was planning parallel, serial, and AC adapters as well as a package that will add 256K of main memory and an extra ROM slot. With these improvements, the Portfolio starts to look like a truly useful piece of hardware.

A HANDFUL OF BRAIN

Hand-helds will appeal to gadget lovers, but are they really useful to anyone else? Initial reports from business users are surprisingly upbeat: Hand-helds *can* boost productivity, especially on the road. Though underpowered compared with such pricey notebook computers as the NEC UltraLite, the Zenith MiniSPort, or the Poqet, today's hand-helds may evolve in the same way the calculator did—from rich man's toy to daily necessity. So if you buy one today, you'll be able to boast you were there first. ●

PALMTOPS ON THE MOVE

Despite sleek exteriors, hand-held computers have yet to shed the gadget image. Atari's new Portfolio, however, stretches the limits of the category.

	CASIO BOSS SF-8000	SHARP WIZARD OZ-7000	PSION ORGAN. II LZ	ATARI PORT-FOLIO
Price	$259.95	$299	$299	$399.95
Volume (cubic inches)	18.1	24.6	40.5	38.4
Weight (ounces) [1]	8.5	8	10	15.87
RAM [2]	64K/64K	32K/96K	32K/288K	128K/640K
Accepts ROM cards		√	√	√
Display (columns by rows)	32×6	16×8	20×4	40×8
QWERTY layout	√			√
Phone list	√	√	√	√
Memo pad	√	√	√	√
Scheduler	√	√	√	√
Calendar	√	√	√	√
Address file	√	√	√	√
Time/alarm	√	√	√	√
Spreadsheet			√ [3]	√
Word processor				√

[1] Including batteries.
[2] Built-in/maximum memory.
[3] Available as extra-cost module.

William Rodarmor is an associate editor for PC World.

FOR MORE INFORMATION ABOUT ALL PRODUCTS IN THIS ARTICLE, CIRCLE READER SERVICE NO. 904.

WHERE TO BUY

Casio BOSS SF-8000
Casio, Inc.
570 Mt. Pleasant Ave.
Dover, NJ 07801
201/361-5400
LIST PRICE: $259.95
Reader service no. 650

Sharp Wizard OZ-7000
Sharp Electronics Corp.
Sharp Plaza
Mahwah, NJ
07430-2135
800/237-4277,
201/529-9542
LIST PRICE: $299
Reader service no. 651

Psion Organizer II LZ
Psion Corp.
118 Echo Lake Rd.
P.O. Box 790
Watertown, CT 06795
203/274-7521
LIST PRICE: $299
Reader service no. 652

Atari Portfolio
Atari Computer
1196 Borregas Ave.
P.O. Box 3427
Sunnyvale, CA
94088-3427
800/443-8020,
408/745-5759,
408/745-2088 (fax)
LIST PRICE: $399.95
Reader service no. 653

It took a certain type of customer to first see the beauty of buying from CompuAdd.

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Some were technoids. Remember? The guys who held their glasses together with a wad of tape. Up to their frontal lobes in microelectronics. Others were the new entrepreneurs, determined to drive the value equation to the highest power. Both recognized a kindred spirit in us.

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- Built-in dual diskette drive controller.
- Built-in parallel printer port.
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- Three full-size expansion slots.
- Two half-size expansion slots.
- Built-in game port interface.
- 8087 math coprocessor support.
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- Optional real time clock.
- 101-key enhanced keyboard.
- 145 watt power supply.

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Ten Top Upgrades for Under $500

Give that aging system a new lease on life. Here are ten economical ways to coax more performance out of your PC and peripherals.

Robert Luhn

INSIDE HOW TO

210 **User Group Tips**
- Once-a-day batch files
- Dressing up *dBASE* reports
- A *WordStar* ASCII file shortcut

The reports of the PC's death have been greatly exaggerated. In spite of a blizzard of "inexpensive" (read $3000) 80386 computers, millions of users still rely on their faithful PCs (and XTs and ATs) to get their computing chores done.

Canny developers haven't ignored this lucrative mass market. There are literally hundreds of products that boost the PC's performance, expand its storage, ferret out more memory, widen its graphics horizons, and generally do what IBM and its followers should have done in the first place. You can't turn a creaky 64K PC into a Compaq Deskpro 386, but you can come awfully close. Best of all, you can do it incrementally, spreading the cost over time.

Kinder, Gentler Upgrades

Enhancing your PC doesn't require the services of a Peter Norton. For example, adding an Intel AboveBoard mainly involves popping the board into a free slot and running a quick menu-driven setup program. The upgrades examined here have been selected with such simplicity in mind, although almost any upgrade can induce a short-term migraine.

But the bottom line is solving knotty problems with the least damage to your wallet; and these upgrades are aimed at delivering maximum value—extending your machine's power for $500 or less. (I've included more expensive products that are sufficiently discounted by PC Connection and other reputable mail-order outlets.) Many of these products have cut the mustard in past *Upgrade Path* columns; oth-

ers are recent discoveries that merit inclusion. Just remember that other great upgrades are out there—and that they don't always come from a Microsoft or an Intel. The little companies that try harder often produce the most innovative products.

The Top Ten

Hardcard 20: Plug-and-Play Hard Disk

Plus Development's Hardcard is famous, and for good reason. When the company's 10MB hard disk on a card debuted in 1986, it set a standard for durability and ease of installation that no competitor has matched. Although the Hardcard was more expensive and a little slower than drives of similar size, you didn't have to open drive bays, fuss with cables, or worry about low-level formatting. You just slipped the Hardcard into one free slot, shut the lid, and typed C:INSTALL C:. Two very big pluses: The Hardcard boasted a 40,000-hour MTBF rating and was built like a tank.

The Hardcard 20 is installed exactly the same way, it's just as slim and durable, and it offers even more goodies. For $795 list (about $500 mail order), you get a 40ms 20MB drive, automatic head parking, a 60,000-hour MTBF rating, and Hardcard Directory—an automatically installed DOS shell that's perfect for beginners or DOS-weary veterans.

Although the Hardcard 20 is the simplest hard disk in the world to install, there are some caveats to keep in mind. The drive works in almost any PC, XT, AT, or compatible and has been tested in 16- to 25-MHz 386 systems, but you should double-check with Plus before you buy. The company also doesn't recommend that you install the Hardcard in one kind of machine and then later run it in another. Note, too, that the Hardcard can't be used with UNIX or OS/2. But if you're a DOS user who needs a hassle-free storage fix, the Hardcard 20 is worth the price.

Plus Development Corp.
1778 McCarthy Blvd.
Milpitas, CA 95035
800/826-8022
LIST PRICE: $795
Reader service no. 685

25 Cartridges in One: LaserJet Fonts for Less

HP has finally discovered that less is more. Instead of forcing LaserJet Series II users to sift through a confusing (and often overlapping) collection of 25 font cartridges, it has repackaged its fonts into 9 cartridges geared by application. It's even lowered the per-cartridge price to $195.

Unfortunately, if your office uses several applications, you'll still have to buy additional cartridges. A far more appealing alternative is 25 Cartridges in One, from Pacific Data. As the name implies, you get the equivalent of HP's entire font cartridge line (172 fonts in all) in one cartridge, plus a lifetime warranty, for only $399.

Installing and using the cartridge is about as easy as upgrades get. Plug it into the LaserJet's cartridge slot, copy the supplied portrait and landscape drivers onto your PC, load your application, select the desired driver, pick your fonts, and print away. The cartridge is compatible with 32 downloadable fonts and, unlike the new HP cartridges, even works in the LaserJet Plus.

The first release of the cartridge supported only a handful of popular applications, but the current driver list now encompasses *1-2-3; Word 3.0* through *5.0; WordPerfect 4.2* and *5.0; WordStar 5, 5.5*, and *2000; MultiMate Advantage II; DisplayWrite 4; Samna Word IV; XyWrite III Plus; Windows/286, Windows/386*, and other *Windows* applications such as *PageMaker, Excel*, and *Ami*. If your program isn't on the list, buy an HP cartridge or you'll be stuck embedding Escape codes in your files—definitely unappealing. Otherwise, 25 Cartridges in One is the only cartridge you'll need.

Pacific Data Products
6404 Nancy Ridge Dr.
San Diego, CA 92121
619/552-0880
LIST PRICE: $399
Reader service no. 686

AboveBoard Plus: PC RAM to the Max

One of the most basic and cost-effective upgrades any PC or XT user can make is to add expanded RAM. Applications from *1-2-3* to *Windows* use expanded memory, as do RAM disks, disk caching programs, print spool-

ers, and other performance boosters. Luckily, RAM prices have dipped, so you can get an Intel AboveBoard Plus with 512K for about $400 mail order and populate it with cheap 150ns or 120ns RAM chips up to 2MB.

Installing the AboveBoard Plus is now a totally software-driven process. (You set DIP switches only on the PC's motherboard to indicate installed conventional memory; the XT finds all available memory at start-up.) Pop the AboveBoard Plus into a free slot, slip Intel's supplied utility disk into drive A:, and type SETBOARD. As you follow the menus, you specify where expanded memory begins, how much you want, and if any AboveBoard RAM should be used to "backfill" your system up to 640K.

The AboveBoard Plus should work cheerfully with most of the boards in your system, but there are some exceptions. A Token-Ring network adapter and the AboveBoard Plus will probably battle. You can break that death grip by adding several device drivers and referencing them in your PC's CONFIG.SYS file. Intel confirms that the AboveBoard Plus definitely conflicts with VGA boards, SCSI adapters, and other 16-bit boards. This problem won't occur in an 8-bit PC or XT, but if you use the AboveBoard Plus in an AT, you'll probably have to disable the 16-bit mode on any installed boards.

Intel PCEO
5200 N.E. Elam Young Pkwy.
Hillsboro, OR 97124
800/538-3373, 503/629-7354
LIST PRICE: $695 (with 512K of RAM)
Reader service no. 687

THE UPGRADE PRODUCT OF THE YEAR: THE SOFT KICKER

With the $99 Soft Kicker, Ventura displays a full, readable page on a VGA monitor. You also eliminate scroll bars and gain an on-screen magnifying glass.

In an upgrade market dominated by hardware add-ons, *The Soft Kicker* points the way to the future of upgrading. Instead of fussing with slots, wires, and connectors in the back of your PC, you merely slip a disk into drive A:, type INSTALL, and answer a few prompts. Load *Ventura*, and you'll gasp—your VGA monitor is suddenly a full-page display (EGA users get 75 percent of a page). *Ventura's* cumbersome scroll bars are gone, too. Just move the mouse pointer in any direction, and the rest of the page pans speedily into view. Click the second mouse button, and a full *readable* page that you can work on appears. If you need to hop back to a precise spot in the document, position the pointer using the on-screen magnifying glass, and click again.

The Soft Kicker* turns *Ventura* into a fluid, dynamic tool and lets you get on with the difficult business of desktop publishing. On a price, performance, and hassle-relief basis, *The Soft Kicker* is easily The Upgrade Product of the Year. —*R. L.

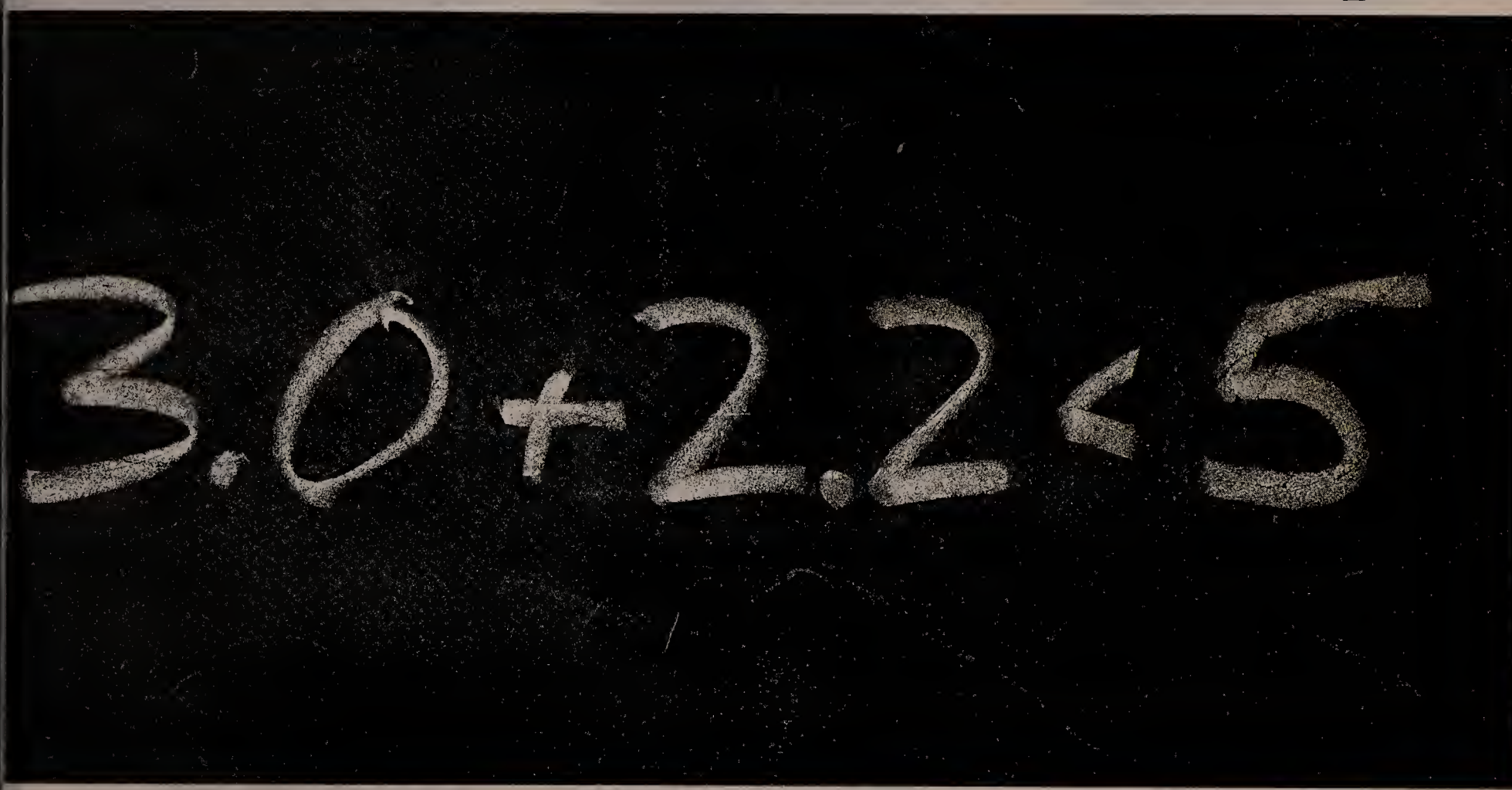
Aristocad Inc.
1650 Centre Pointe Dr.
Milpitas, CA 95035
800/426-8288, 800/338-2629 California, 408/946-2747
LIST PRICE: $99
Reader service no. 694

Math Coprocessors: The Poor Man's Accelerator

If you're a number or graphics cruncher, your first upgrade should be an Intel 8087, 80287, or 80387 math coprocessor. Although plugging the chip into your system's motherboard is a little daunting, it can make a startling performance difference. For example, according to Intel's preliminary benchmarks, *1-2-3 3.0* will recalculate a worksheet three to six times faster when a coprocessor is installed.

Depending on the system and

For More And More Users, The Latest From Lotus Doesn't Add Up.



The idea of juggling two incompatible spreadsheets that will turn users into haves and have-nots has many managers worried.

It just doesn't make sense.

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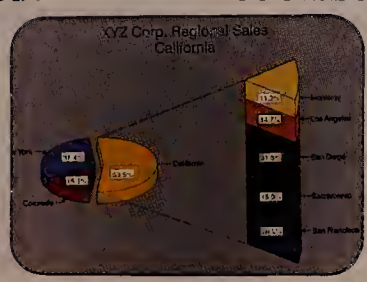
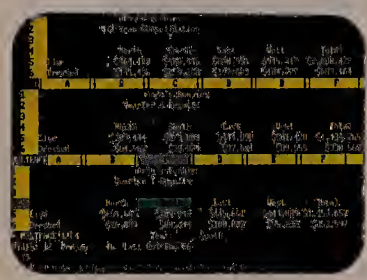


The most advanced 3-D graphics any spreadsheet has ever offered.

Like multiple types of spreadsheet linking. Stunning, new 3-D graphics. Presentation-quality output complete with fonts, shading and grids. Extensive auditing and debugging features. And, of course, it totally coexists with Lotus® 1-2-3,® including menus, macros and files.

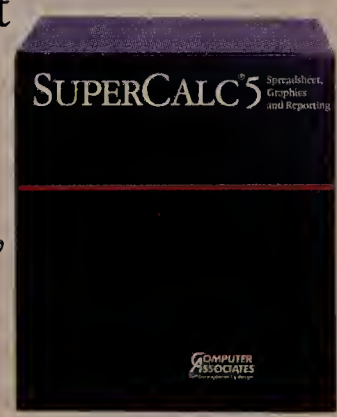


The latest in spreadsheet linking saves time and reduces mistakes. 3 spreadsheets can be viewed.

There are also IBM® mainframe and VAX versions, (how long will that take Lotus?) and all of them are backed and supported by the world's leading independent software company.

To find out more, call 1-800-531-5236 (in Canada, 1-800-663-6904). And think twice about any Lotus upgrade.

For most users, it just doesn't compute.



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Circle 246 on reader service card

the speed of the coprocessor, you can pay anywhere from $89 (mail-order price for a 5-MHz 8087) to $229 (for a 10-MHz 80287) to $399 (for a 25-MHz 80387). If you plug an 8087 into a PC or XT, you'll need to flip one motherboard DIP switch; on 80286 and 80386 machines, you'll have to run the system's setup program.

Physically installing a coprocessor is not for newcomers. If you plug in the chip slightly askew, you'll snap off a pin and destroy your investment. And if the pins aren't perfectly straight, you must either realign them with a pair of needle-nose pliers or take the chip, place the errant row flush on a flat surface, and press down. And if you put the chip in backward, you'll have to yank it out and start all over. In short, let a dealer or your company guru tackle this upgrade. But don't put it off—this is the cheapest way to turbocharge your computer.

Intel PCEO
Reader service no. 688

LaserTorq: Warp-Speed Printing

Someday, when the 80586 finally makes multitasking on the PC a reality, you'll be able to print files in the background while you work on something else—and not go mad. Until that halcyon time arrives, the rest of us will use *LaserTorq*, a high-speed print buffer program that has no peer. Whether you print out TIFF-laden *PageMaker* files or *WordPerfect* documents, you'll be flabbergasted at how quickly your PC is freed up.

The $99 *LaserTorq* essentially intercepts printer-bound data and stores it in a RAM or disk buffer, freeing up your PC for other business; the data is then rocketed off to your printer. In informal tests, a scanned image that locked up a Deskpro 386/20e for 6 minutes was gone in 3 minutes; a five-page *Word* document packed with fonts that took 2 minutes to print was spooled in 5 seconds. Thanks to *LaserTorq*'s graphics optimization feature, you can even print out a full-page 300-dpi graphic on a LaserJet with 512K of RAM.

Configuring *LaserTorq* is a dream. A menu-driven setup program leads you by the hand, prompting for printer port, location of file buffer (on disk or in conventional, expanded, or extended memory), buffer size, and so on. *LaserTorq*'s default settings are usually fine, but you can customize the program to an amazing extent. Just don't dole out more RAM than you have—it's easy to forget previously installed RAM disks and disk caches.

LaserTorq is also a godsend for ink jet and plotter users, and its predecessor, *Torq*, is perfect for dot matrix users. Two cautionary notes: Although *LaserTorq* is a zippy spooler for *Win-*

EIGHT RULES FOR HAPPIER UPGRADING

Rule #1: Ask yourself, Will this upgrade solve my problems for at least a year? Sometimes the best long-term solution is scrapping your old system and laying out the dough for a new one.

Rule #2: If you're not sure an upgrade will work with your machine or your applications, call the upgrade's manufacturer and your system vendor. If either one has doubts, pass—or proceed very carefully. Confirm that the upgrade won't nullify your system's warranty; make sure, too, that you can return the upgrade for a full refund.

Rule #3: Be wary of one-way upgrades. For example, devices that give your dot matrix printer LQP powers may force you to cut wires, jump connections, and perform other irreversible acts. Make sure you really need this upgrade—there may be no turning back.

Rule #4: Avoid upgrades that push your system beyond reasonable limits. For example, kits that use faster clock crystals to boost the AT's 8-MHz 80286 to 12 MHz could fry the chip's innards. Worse, the accelerated processor could generate erroneous calculations—a disaster for spreadsheet users.

Rule #5: Don't rush out and buy upgrades that aren't supported by popular applications. For example, several years ago vendors pushing "super" EGA boards neglected to include drivers for popular programs, leaving users high and dry. Read *PC World* and other hip magazines, and you may discover that superior, widely adopted technology (like VGA boards) may be just around the corner.

Rule #6: Save everything. Someday the 286 turbo board in your PC may die—and that old 8088 chip you removed will come in mighty handy.

Rule #7: Protect yourself. Look for upgrades that come with a money-back guarantee or at least a one- or two-year warranty.

Rule #8: If an upgrade is beyond your skills, pay a reputable dealer to perform the task. It may cost you $50 an hour, but if your computer or upgrade is trashed, at least you won't be responsible. —*R. L.*

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- ☐ 286 systems
- ☐ 386 systems
- ☐ Peripherals
- ☐ Other

B. Are you an:
- ☐ End user
- ☐ Consultant
- ☐ Reseller
- ☐ Corporate purchaser
- ☐ DP/MIS
- ☐ Business owner

C. How many business PCs do you now have installed?
- ☐ 1-25
- ☐ 26-100
- ☐ Over 100

D. How many PCs does your company plan to purchase in the next 12 months?
- ☐ 1-25
- ☐ 26-100
- ☐ Over 100

E. What is your primary computing interest?
- ☐ Corporate/Institutional
- ☐ Small business
- ☐ Student/Educational
- ☐ Home

3045

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TITLE _____
COMPANY _____
ADDRESS _____
CITY _____ STATE _____ ZIP _____
MAIN SWITCHBOARD NUMBER _____
DIRECT NUMBER _____

A. Which products interest you most?
- ☐ 8088/8086 class systems
- ☐ 286 systems
- ☐ 386 systems
- ☐ Peripherals
- ☐ Other

B. Are you an:
- ☐ End user
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- ☐ Over 100

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- ☐ 26-100
- ☐ Over 100

E. What is your primary computing interest?
- ☐ Corporate/Institutional
- ☐ Small business
- ☐ Student/Educational
- ☐ Home

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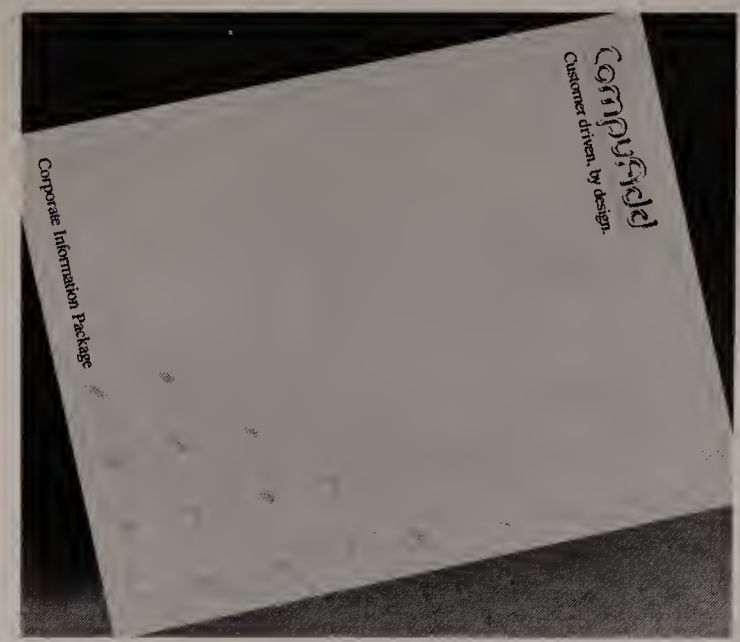

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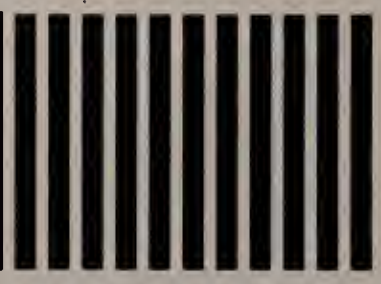

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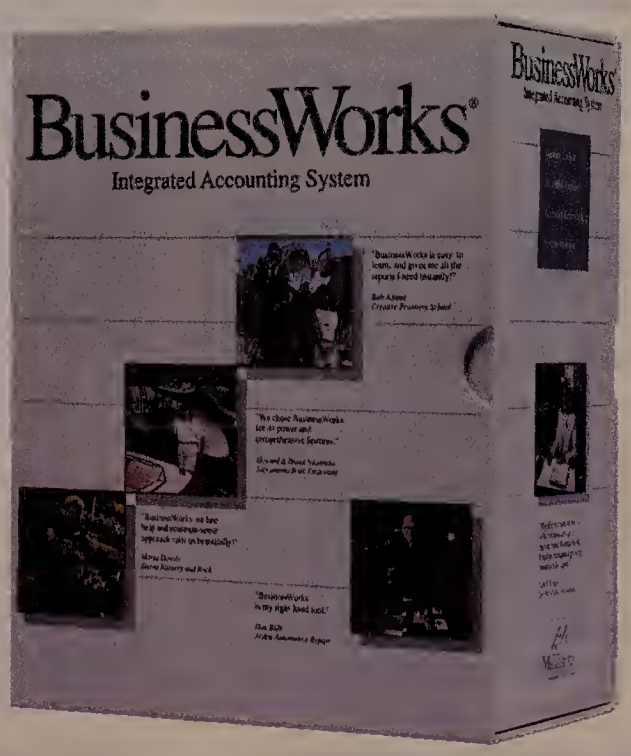

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SOFTWARE SYSTEMS

Circle 169 on reader service card

dows/286, you won't see much improvement with *Windows/386*. Desktop publishers and others printing massive graphics files should also remember that an optimal *LaserTorq* buffer will probably need 1MB to 2MB of RAM.

LaserTools Corp.
5900 Hollis St., Suite G
Emeryville, CA 94608
800/346-1353, 415/420-8777
LIST PRICE: $99
Reader service no. 689

All Chargecard: More Memory for Your 286

If *Desqview* or *Windows* or your worksheets squeak every time you load them—in short, if you lust for the conventional RAM hiding between 640K and 1MB on your 80286 system—the All Chargecard is your baby. Just place this tiny $399 board between an 80286 and its motherboard socket, and your system can access up to 960K of conventional memory. The All Chargecard also lets your 80286-based system tap as much as 16MB of extended memory, which it can treat as EMS 4.0 expanded memory.

Physical installation, however, isn't a job for the casual user. You must wrest the 80286 from its socket, plant the Chargecard in the vacant spot without crushing any nearby components, then plug the 80286 into the Chargecard. You can avoid squashing anything by using the company's $100 socket extender—an item that should have been part of the deal.

Software setup is simpler, fortunately—you merely copy over the supplied EMS 4.0 driver and reference it with a DEVICE statement in CONFIG.SYS. However, tweaking the Chargecard—freeing up more RAM for *Desqview* or *Windows*, loading TSRs into extended memory, and avoiding miscellaneous hardware conflicts—means fiddling with DEVICE statements ad nauseam.

Still, the Chargecard is a deal, and it works in most 286 systems. It may choke on some 16-MHz 286s, though, and if your computer relies on "ROM shadowing"—where ROM code is copied into RAM for faster execution—you'll need to disable the function or obtain a patch from the system vendor. When in doubt, call All Computers before you make this upgrade.

All Computers Inc.
1220 Yonge St.
Toronto, Ontario
M4T 1W1 Conodo
416/960-0111
LIST PRICE: $399
Reader service no. 690

Last.Bat: Die-Hard Battery

Most people forget about their AT's system battery until it dies—and takes the system's setup information with it. If you want to replace this fickle component—and reconfigure your system—only once, consider Accumation's rechargeable Last.Bat battery.

Installation isn't painless, but it's relatively straightforward. Open up your AT, pull the battery off the inside of the system shell, unplug it from the motherboard, and put the Last.Bat in its place. The only difference: You plug one of the AT's white power connectors into a receptacle on the Last.Bat, so the battery can recharge forever after.

Well, not quite. The Last.Bat comes with a lifetime warranty, but it will probably last about ten years—time enough to save up for that 80586 with 16 gigabytes of RAM.

Accumation, Inc.
8817 Southwest 129 Terr.
Miami, FL 33176
305/238-1034
LIST PRICE: $49.95
Reader service no. 691

Northgate UFDC: Four Times the Floppy Storage

Tired of the *clankklunkscreech* of your PC's ancient 360K floppy drives? Tired of hooking up *LapLink* so your desktop PC can swap files with your laptop? Need a quick, cheap storage boost for your system? The answer might be a new floppy disk controller. Northgate, Micro Solutions, Sysgen, SOTA Technology, and other companies offer multitalented controllers that can control four 360K, 1.2MB, 720K, or 1.44MB floppy drives simultaneously in almost any kind of DOS computer. They all cost between $100 and $150, depending on the extras—which might include serial and parallel ports and the ability to run tape drives, 2.8MB floppy drives, or even ancient 8-inch floppy drives.

With high-capacity floppy drives costing barely $100, this is one upgrade you can't pass up. However, since these controllers are a pain to install, you may want more experienced (and more patient) hands performing the chore.

The Northgate Universal Floppy Disk Controller (UFDC) is typical of the breed. Unpack the board, and you discover there's no power cable splitter—a rather vital extra since the PC's and XT's two power-supply leads may already be connected to other devices. Configuring the

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Circle 36 on reader service card

controller is another headache. You have to set switches on the board noting each drive's capacity and step rate and identifying the UFDC as a primary or secondary controller. Once you've installed the board and connected it to its floppy drives, you copy device drivers to your PC's boot disk and add DEVICE statements to CONFIG.SYS. These specify the kinds of drives you've installed and allow older versions of DOS to format 3½-inch drives. With DOS 3.1 or earlier versions, you must format 3½-inch disks with a supplied utility.

Simple? No. But it's a terrifically cheap upgrade. However, before you buy one of these controllers, make sure the vendor certifies the board for your machine and drives.

Northgate Computer Systems
13705 First Ave. N
Plymouth, MN 55441
800/526-2446, 612/476-4400
LIST PRICE: $99
Reader service no. 692

dClock II: A Slotless Clock for the PC

As humble upgrades go, the dClock II is among the humblest. Snap this little board onto the back of a floppy disk drive, install some software, and you've got a built-in 24-hour clock/calendar. If you're tired of supplying the date and time every time you boot up—and if your accounting and other programs demand time and date stamping—the dClock is worth the $49.95.

Adding the dClock to your PC, XT, or even AT (which has a built-in clock/calendar chip) takes about 10 minutes. Turn off your PC, remove the data cable from a floppy drive, mate it with the dClock board, and push the assembly back onto the disk drive's edge connector. Reassemble the PC, turn it on, slip the supplied utility disk into drive A:, and type INSTALL. Answer a few prompts, and AUTOEXEC.BAT is suitably modified; supply the current date and time, and the dClock takes it from there.

MicroSync, Inc.
2107 W. Euless Blvd.
Euless, TX 76040
800/543-0161, 817/540-0938
LIST PRICE: $49.95
Reader service no. 693 ●

Robert Luhn is a senior editor for PC World *and the editor of* The Upgrade Path.

POWER TIP NO. 79

Comments for Framework Formulas

Attaching comments to *Framework* formulas is easy. Although the manual doesn't say so, typing a semicolon after a formula makes the program recognize all text following the semicolon as a comment. To embed multiple lines of comments in a cell, just begin each line with a semicolon. Here's an example:

```
@SUM(A3:A10);This
;is the total of all widgets
;sold according to the
;monthly figures consoli-
;dated as of 3/31/88.
```

Paul Lichtman
Millburn, New Jersey

USER GROUP TIPS

Helpful hints from members of the nation's user groups

An AUTOEXEC.BAT File for Once-a-Day Routines

By adding three lines to AUTOEXEC.BAT and creating a file called CURRENT.BAT (see **LISTING 1**), you can automatically run selected programs once a day, regardless of how often you reboot.

Then, at every boot, your system will create (or recreate) two batch files, which in turn will create two memory variables—one of the current date and one of the last boot's date. If the two variables match, the once-a-day programs have already run and are skipped.

With an editor, create CURRENT.BAT as shown in **LISTING 1**, and add the following three lines to the end of your AUTOEXEC.BAT file:

```
echo. | date>today.bat
if exist lastboot.bat lastboot
today
```

```
set today=%4
echo set lastboot=%4>lastboot.bat
echo today>>lastboot.bat
if %today% == %lastboot% goto end
.
.
.
[Once-a-day programs listed here]
.
.
.
:end
```

LISTING 1: CURRENT.BAT for once-a-day programs

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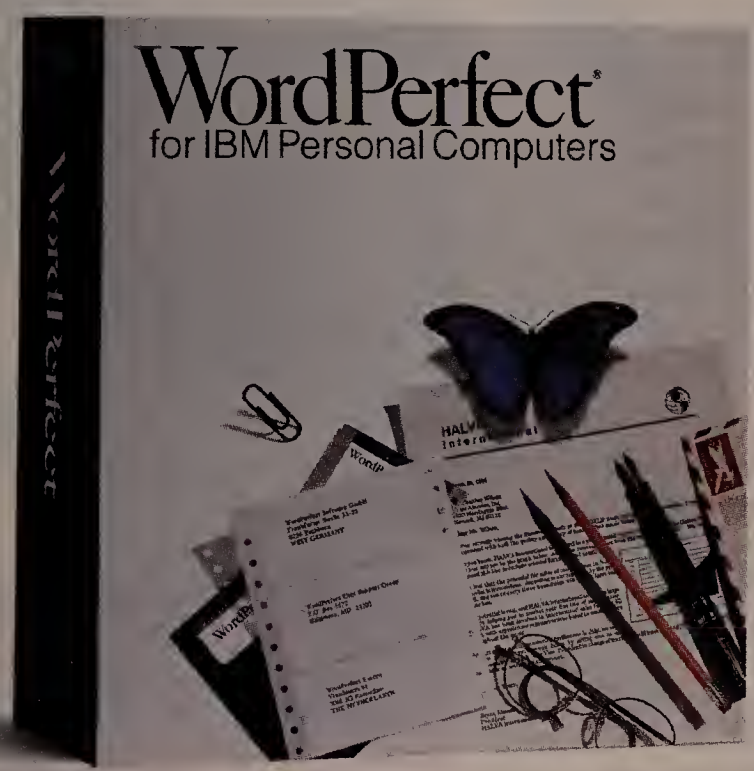

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Circle 175 on reader service card

AUTOEXEC.BAT will now write the output of the DOS DATE command to a file called TODAY.BAT, then it'll look for the file LASTBOOT.BAT, left over from the last time CURRENT.BAT was run. If LASTBOOT.BAT is present, it's executed; if not, the newly created TODAY.BAT is.

LASTBOOT.BAT saves the date from the last boot to a variable called LASTBOOT and runs TODAY.BAT. TODAY-.BAT calls CURRENT.BAT, passing it the current date.

Along with creating a new LASTBOOT.BAT file, CURRENT.BAT plugs the date into the TODAY variable and compares it with the LASTBOOT variable. If they match, CURRENT.BAT jumps to the :END label, skipping any commands in between. Any program listed between the IF command and the :END label will be run only once a day.

Don Simpson and Les Siemens
Tucson Computer Society

Better-Looking dBASE III Plus Reports

dBASE III Plus's report generator won't garner you any prizes for beautiful business documents. But if you have a printer that supports the IBM extended character set, you can dress up your reports with single-, double-, or thick-line boxes.

For instance, to put a double line around a page title, select 'Page title' from the report generator's Options menu, bringing up an empty text box. Press <Enter> to move to the second line of the box. Hold down the <Alt> key while you press 186 on the numeric keypad; release the <Alt> key, and a double vertical line appears. Type your title, followed by another double vertical line.

Move to the beginning of the first line, and enter an ASCII 201 using the same <Alt> method to produce a top left corner. Enter an ASCII 205 repeatedly until you have a double horizontal line stretching above your title, then enter an ASCII 187 to create the top right corner. Move the cursor to the beginning of the third line, and repeat the process, using an ASCII 200 for the bottom left corner and an ASCII 188 for the bottom right. Press <Ctrl>-W to save and exit.

With the help of an ASCII chart, you can use other extended characters to spruce up drab *dBASE III Plus* reports.

Vic Saravia
San Francisco Personal Computer Users Group

WordStar ASCII Files Made Easy

Converting *WordStar 5.5* files to ASCII requires a lengthy trek through the Print menu. The following Shorthand macro will speed up this process.

Enter the macro editor by pressing <Esc>?. Assign a hotkey character such as A, then enter a description of the macro, say, 'Converts file to ASCII'. Press <Enter>, and type the following: <Ctrl>-P<Ctrl>-K<Ctrl>-P<Ctrl>-DP<Ctrl>-P<Enter><Ctrl>-P<Enter><Ctrl>-P<Enter>ASCII. Press <Ctrl>-P<Enter> six more times, then type Y.

At this point, the definition box should display ^K^DP^M ^M^MASCII^M^M^M^M ^M^MY. Press <Enter> <Enter>Y to exit and save.

To use the macro, open the file you want to convert, and press <Esc>A. *WordStar* will create a text file called ASCII.WS.

Ray Miller
Frog Computer Users Group
Rochester, New York

Chip in! If you're a member of a user group and have tips to share, send them to PC World. *We pay $25 for each published tip. Or if you have a business problem that requires a PC solution, get in touch with our experts. See How to Contact PC World, page 4.*

POWER TIP NO. 80

Find That File With Smartcom III

To find a file during a *Smartcom III* session, use the Locate File command that's tucked two menus below the main menu. Press D for Disk Operations, the period for Special Operations, and then L for Locate File. At the prompt, you can enter a file name or search with the DOS wild-card characters (* and ?). *Smartcom* displays a list of all files matching the search criteria, along with their paths. Just press <Esc> twice to return to the Disk Operations menu.

Toru Tanaka
Los Angeles, California

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MONEYCOUNTS 6.0

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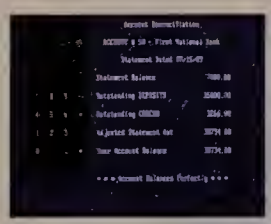
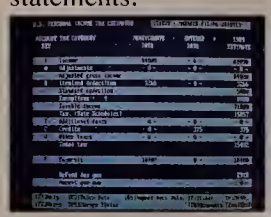
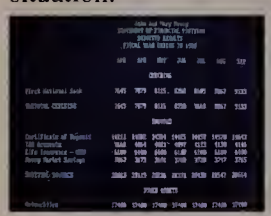


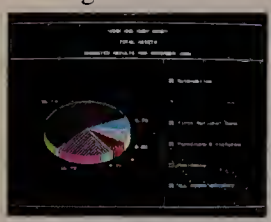
MONEYCOUNTS' smart account balancer makes fast work of even the toughest bank statements.



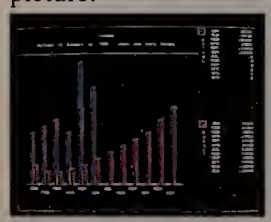
MONEYCOUNTS' Tax Estimator helps you quickly size up your federal tax situation.



All reports can be displayed to screen and easily viewed using vertical and horizontal title locking.



3-D pie charts let you quickly visualize your complete financial picture.



3-D bar charts let you easily compare your actual and budgeted results.

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Manufacturer	Parsons Technology	Intuit, Inc.	MECA Ventures, Inc.	Monogram Software, Inc.
Suggested Retail Price	**$35.00**	**$59.95**	**$219.98**	**$179.95**
Account Balancer	YES	YES	YES	YES
Automatic Error Finder	YES	NO	NO	NO
Accounts Can Be Added When Entering Transactions (Data)	YES	YES	YES	NO
Financial Reports				
Actual Financial Results	YES	YES	YES	YES
Month and Year to Date	YES	YES	YES	YES
All Months On One Report	YES	YES	YES	YES
Budgeted Financial Results	YES	YES	YES	YES
Actual Compared to Budget	YES	YES	YES	YES
Actual Compared to Prior Month	YES	NO	NO	NO
General Ledger Report	YES	YES	NO	NO
Accountant's Trial Balance	YES	NO	NO	NO
Net Worth Computation	YES	YES	YES	YES
Inquiry Reports				
Check and/or Deposit Register	YES	YES	YES	YES
Account Analysis	YES	YES	YES	YES
All Transactions with Party	YES	YES	YES	YES
Cash Requirements Forecast	YES	YES	YES	YES
Aged Invoices Payable	YES	NO	YES	YES
Reports Export to Lotus or Quattro	YES	YES	YES	YES
Graphics	YES	NO	YES	YES
Bar Charts	YES	NO	YES	YES
Pie Charts	YES	NO	YES	NO
Optional Password Protection	YES	YES	NO	YES
Financial Calculator	YES	NO	YES	YES
Prints Amortization Schedules	YES	NO	YES	YES
Prints Accumulation Schedules	YES	NO	YES	YES
Mail List Manager	YES	NO	YES	YES
Prints Address Labels and Index Cards	YES	NO	YES	YES
Prints Telephone Directory	YES	NO	YES	NO
Mail Merge with Word Processor	YES	NO	YES	YES
Check Writer	YES	YES	YES	YES
Prints Laser Checks	YES	YES	YES	NO
Prints Any Pin-Feed Check	YES	NO	YES	YES
Personal Income Tax Estimator	YES	NO	YES	YES
Pop-up Note Pad	YES	NO	YES	YES
Pop-up Math Calculator	YES	YES	YES	YES
Optional Canadian Features				
International Dating	YES	YES	NO	NO
International Terminology	YES	NO	NO	NO
Capacity				
Total Number of Accounts Per File	999	255	**	120
Total Number of Open Transactions	100,000	65,535	**	4,000

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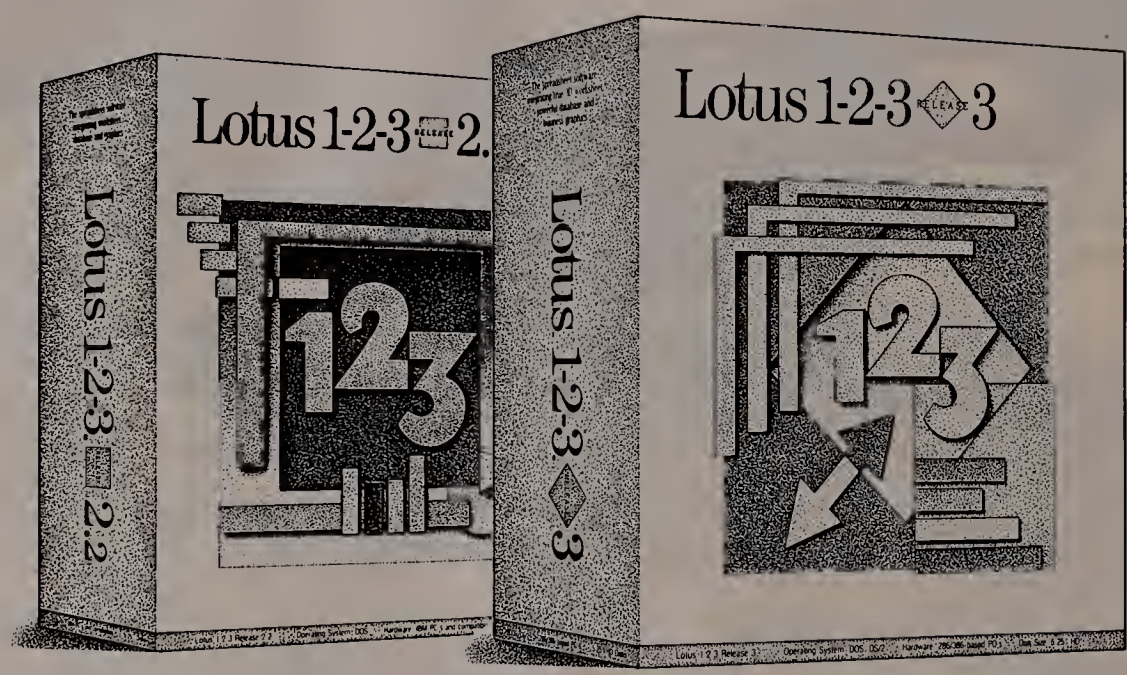
1-800-624-0503



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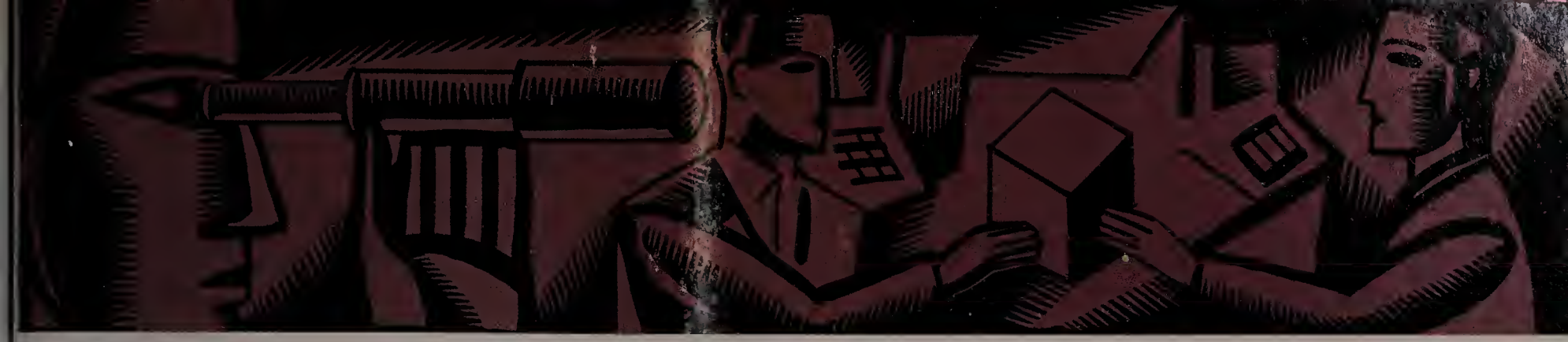

CONSUMER WATCH

Advice and information for the computer consumer

Attention, shoppers! Shareware can be a great deal—but only if you buy it wisely and manage it responsibly.

Anita Amirrezvani

Sharing the Wealth

Few industries are as attuned to business buyers as the shareware industry. Where else can you try an item for free and then buy it only if you're completely satisfied? Where else can you find unique, market-specific products not even available commercially? How else can you avoid the high cost of commercial software? At its best, shareware delivers excellent value—as long as it's evaluated carefully and then managed properly, particularly within an organization.

Most shareware can be purchased directly from shareware authors or through distributors such as California Freeware and PC-SIG. Purchasing directly from the author provides certain advantages: You can find out direct from the horse's mouth exactly how the program works, be certain you're getting the most current version, and avoid any viruses that might creep into shareware posted on public BBS's.

But it's important to check out shareware companies before sending your money off into a potential black hole. *Consumer Watch* reader Gary Shweid found out the hard way when he tried to purchase the most recent version of graphics conversion shareware called *Iconvert*. He sent a check for $49.95 to Infinity Engineering Services in Chandler, Arizona, in October 1988, waited five weeks, and finally received a disk that failed to work. When he wrote to the company asking for a replacement or a refund, he received no response. After four months, Shweid managed to locate the company's phone number and called to ask for a refund. Although a refund was promised, it never arrived, and when he tried the phone number again, it was disconnected. *Consumer Watch*'s efforts to contact the vendor were similarly unsuccessful.

To avoid hit-or-miss service, consumers should take some precautionary steps. If only a post office address is available, contact the shareware company by mail and ask for a business phone number before purchasing the product. Or call a distributor to make sure that the author is known and legitimate, and then try to pay by credit card in case you need to refuse payment for nonreceipt or a defective product.

Consumers can also purchase shareware and sometimes even register it through shareware distributors. Although these disk vendors offer varying prices and services, many shareware authors suggest that you purchase disks from distributors approved by the Association of Shareware Professionals (ASP), an organization of about 150 shareware-author members.

ASP chairman of the board Jim Button says that shareware distributors who display the ASP logo agree to distribute only the most current versions of shareware, to respect shareware authors' copyright requirements, and to follow an honesty-in-advertising rule. Ads must attempt to educate users about shareware and must include the statement "Shareware programs require separate payment to the authors if found useful."

ASP disk vendors are also expected to describe the shareware accurately. "Some disk vendors make incorrect statements about what a shareware program is or does," says Button. "A disk

(continues)

ANTHONY RUSSO

vendor once said that *PC-Calc* was a *1-2-3* clone; someone who bought the program expecting to use existing Lotus macros or files would have been terribly disappointed."

By pledging to respect shareware authors' copyrights, ASP disk vendors also protect consumers from confusing copyright situations. Take *Procomm*, for example, the popular communications program from Datastorm Technologies. Although the original *Procomm* may still be legally sold as shareware, *Procomm Plus* may not. In fact, Datastorm recently filed suit against a San Diego distributor called Walden's Public Domain Software for allegedly violating *Procomm Plus*'s copyright by selling it as shareware.

To help interested consumers keep up-to-date on shareware, the ASP offers a list of all ASP-member products, complete with full descriptions and current version numbers. You can find the list on CompuServe under the file name CATLOG.ARC; an update file called CATUPD.ARC is posted monthly. Additionally, these lists are available on dozens of major BBS's under slightly different file names; look for files that begin with the letters *ASP* and *UPD*.

Fortunately, consumers with complaints about ASP authors or disk vendors also have a place to go for help. ASP offers a dispute-resolution service through its ombudsman. Simply write to Ombudsman, P.O. Box 5786, Bellevue, WA 98006, or send a message to CompuServe 70007,3536.

The Other Side of the Coin

In return for enjoying the benefits of shareware, managers

(continues)

TABLE 1

Big Savings on Popular Shareware

You can get huge discounts by buying shareware in volume or by purchasing a site license. Deeper discounts may be available if you purchase some copies without documentation.

Company/ Product	Retail cost per copy	Site License: Number of copies	Site License: Percent discount	Volume Discount: Number of copies	Volume Discount: Percent discount
Brown Bag Software 408/559-4545					
MindReader	$89.95	100–200	55	0–9	0
PC-Outline	$89.95	201–300	60	10–20	10
PowerMenu	$89.95	301–500	65	21–100	20
RamTest	$69.95	501 +	70	101–250	30
HomeBase	$49.95			251 +	40
Goal-Seeker	$20				
ButtonWare 206/454-0479					
PC-File:dB	$89.95	negotiable		1–4	0
PC-File +	$69.95			5–9	20
PC-Calc +	$69.95			10–49	25
PC-Type II	$89.95			50–99	30
PC-Type +	$69.95			100 +	35
PC-Dial	$59.95				
Baker's Dozen	$59.95				
EZX Publishing 713/280-9900					
EZ-Forms Executive	$119	15 copies $1190, then $30 each		0–1	0
EZ-Forms Lite	$59	15 copies $590, then $20 each		2–4	10
EZ-Copy Plus	$199	15 copies $1480, then $40 each		5–9	15
EZ-Copy Lite	$39	15 copies $390, then $15 each		10–24	20
				25 +	25
Forbin Project 319/232-4516					
Qmodem SST	$30[1]	1–10	0	same as site license	
		11–20	5		
		21–30	10		
		31–40	15		
		41–50	20		
		51–100	25		
		101–200	30		
		201–300	35		
		301–500	40		
		501 +	50		

(continues)

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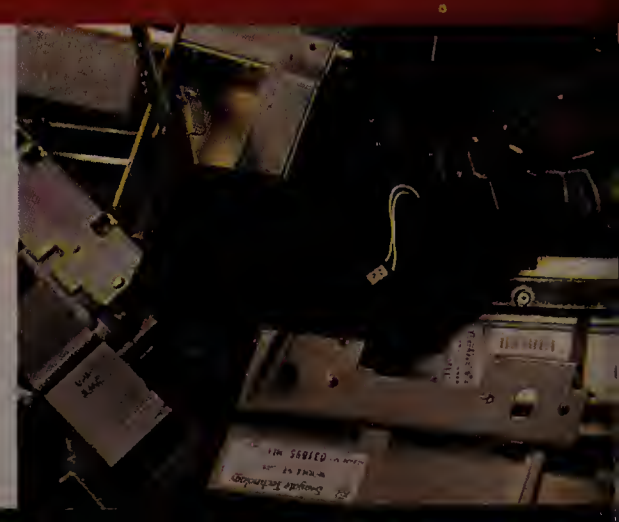

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- ☐ The man who wrote the book on data recovery!

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should make sure it's used responsibly within their organizations. Too often, PC users install a shareware program without bothering to register it. Or the shareware is installed by a PC clone vendor who includes it "for free" with a hardware purchase.

Some vendors try to make it easy for managers to spot unregistered shareware. Magee Enterprises, for example, distinguishes between registered and unregistered *Automenu* disks. "Our shareware disk is gray; the serial number has an 'SW,'" says marketing specialist Karin Rogers. "The registered disk is blue and has a regular number."

Managers should also educate users by issuing guidelines about proper use of shareware. The guidelines should set limits on how long shareware may be used on a trial basis before being officially registered.

In addition to receiving the usual software niceties for registering shareware, including printed documentation, technical support, bug fixes, and product updates, managers can take advantage of the steep discounts shareware companies offer for volume purchases. ButtonWare, for example, the maker of *PC-File* and *PC-Calc*, discounts its products 35 percent in quantities of 99 or more. Magee Enterprises sells a $10,000 site license for 1000 copies of *Automenu*, bringing the cost per program down to $10.

Companies like FormalSoft, maker of the spreadsheet *QubeCalc*, provide a standard quantity discount and then reduce the price even further if extra manuals and disks aren't needed. For example, you could buy ten copies of *QubeCalc* at 25 percent off the usual price of $69.95, or $52.46 each, according to FormalSoft president Bruce Buzbee. You could then receive an additional discount by opting to buy up to half of the ten copies without manuals. Those copies—essentially, their labels and licenses—would sell for 40 percent less, or $31.48 each.

In addition to enjoying good discounts, technical support, and a clear conscience, managers who support shareware fairly are promoting a consumerist philosophy. By rewarding individual programmers who provide good value, managers encourage their efforts and help to keep the price of software in check. And that's good business all around.

(continues)

TABLE 1 (continued)

Company/ Product	Retail cost per copy	Site License: Number of copies	Site License: Percent discount	Volume Discount: Number of copies	Volume Discount: Percent discount
FormalSoft 801/565-0971					
QubeCalc	$69.95	1–2	0	same as site license	
InstaCalc	$49.95	3–5	15	same as site license	
		6–9	20		
		10–24	25		
		25–49	30		
		50–99	35		
		100–249	40		
		250–499	45		
		500+	50		
Magee Enterprises 404/446-6611					
Automenu	$69.95	1000 copies $10,000, unlimited copies $25,000		1–9	0
				10–49	15
				50–99	25
				100–249	35
				250–499	45
				500–999	55
OmniVerse 206/228-7627					
Galaxy	$59.95	1–9	0	same as site license	
		10–50	25		
		50–100	33		
		101+	negotiable		
Quicksoft [2] 206/282-0452					
PC-Write	$99	1	10	1	0
		2–9	30	2–9	20
		10–24	35	10–24	25
		25–99	40	25–99	30
		100–249	45	100–249	35
		250–999	50	250+	40
		1000+	55		

[1]Documentation costs $15 extra per copy.
[2]Site license requires $500 annual purchase.

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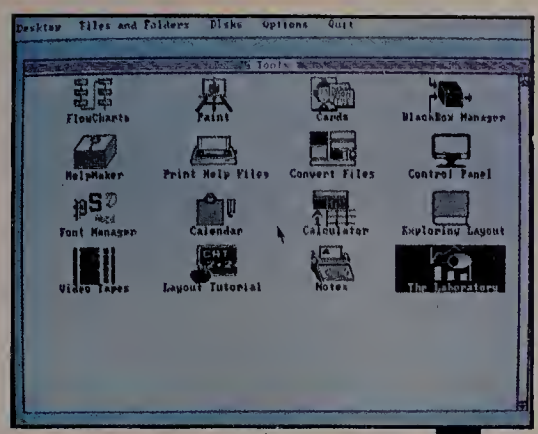

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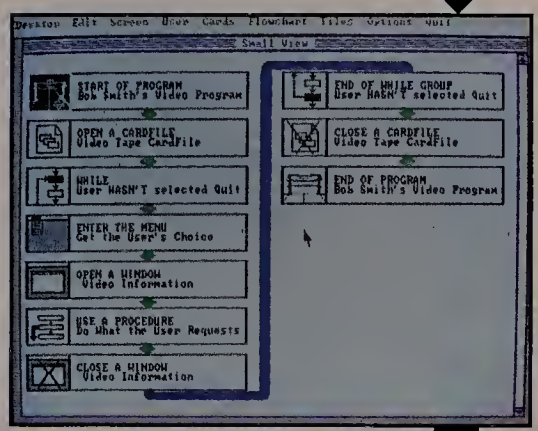

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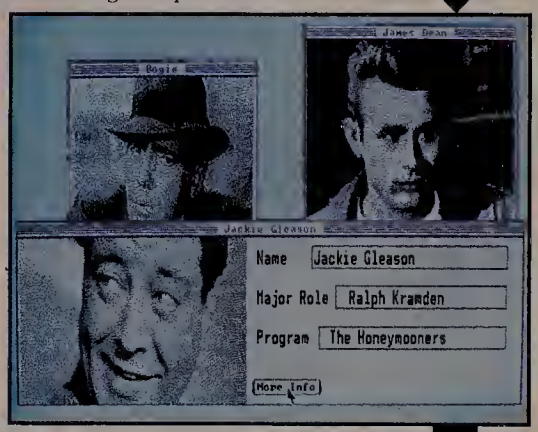

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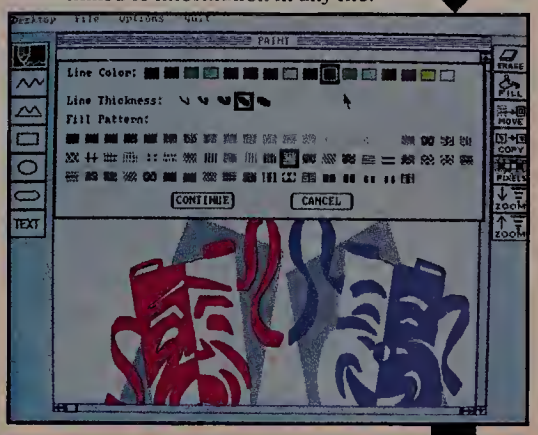

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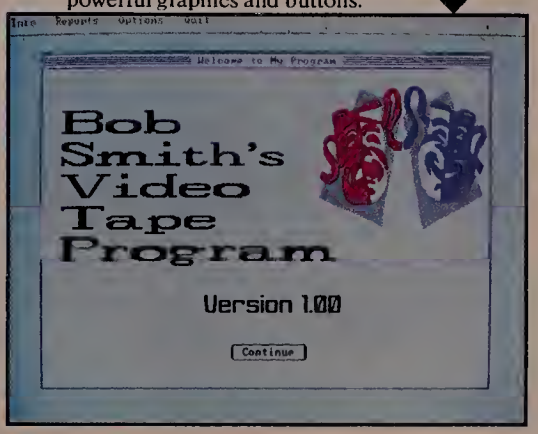

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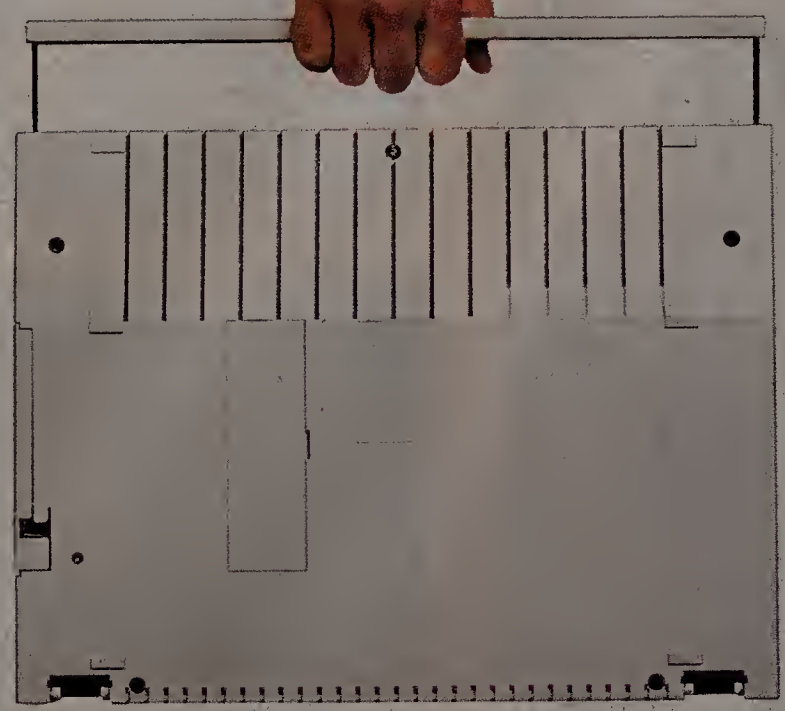

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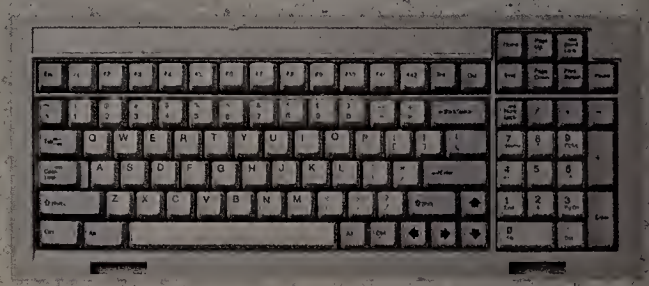

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Circle 241 on reader service card

SHOP TALK

Watch Your Language!

In August 1988, I purchased a Compaq Deskpro 286, my fourth PC. Before buying it I checked the specification book supplied by Compaq, which said that the unit came with 640K of RAM, upgradable to 2.1MB with the addition of three 512K memory upgrade kits. A few months later I purchased *Oracle*, which requires most of that 2.1MB of memory. But Compaq's documentation didn't mention memory expansion, so I examined the motherboard and found 54 sockets for memory expansion chips. I called Compaq to double-check and was told to contact an authorized dealer. I phoned three Compaq dealers in Phoenix and got three different answers on how to do it.

Since this information was questionable, I called a mail-order company that advertises in *PC World* and was told that I could simply buy the chips and plug them in. I made the purchase, put the chips on the board, and...nothing.

I left a message at Compaq technical support, waited two days without hearing from them, and then, in exasperation, called another dealer. "It's simple," he said. "Just find the DIP switches on the left side of the board and turn on switches four and five." Voilà—it worked!

A few days later I learned that Compaq had finally called and left a message indicating that a memory expansion board was what I needed. I called Compaq again to describe my experiences and asked why the manual didn't mention how to install the memory on the motherboard. "It's too technical for most users," the representative said, "but a technical manual is available from the distributor—for $150."

Leonard E. Herzmark
Scottsdale, Arizona

Compaq responds: We are sorry that some of the dealers seemed to misunderstand the question. As you know, *expanded memory* has a specific meaning in the industry, different from *memory expansion*. It is confusing, to be sure. Our customer relations representative thought Mr. Herzmark was asking about expanded

(continues)

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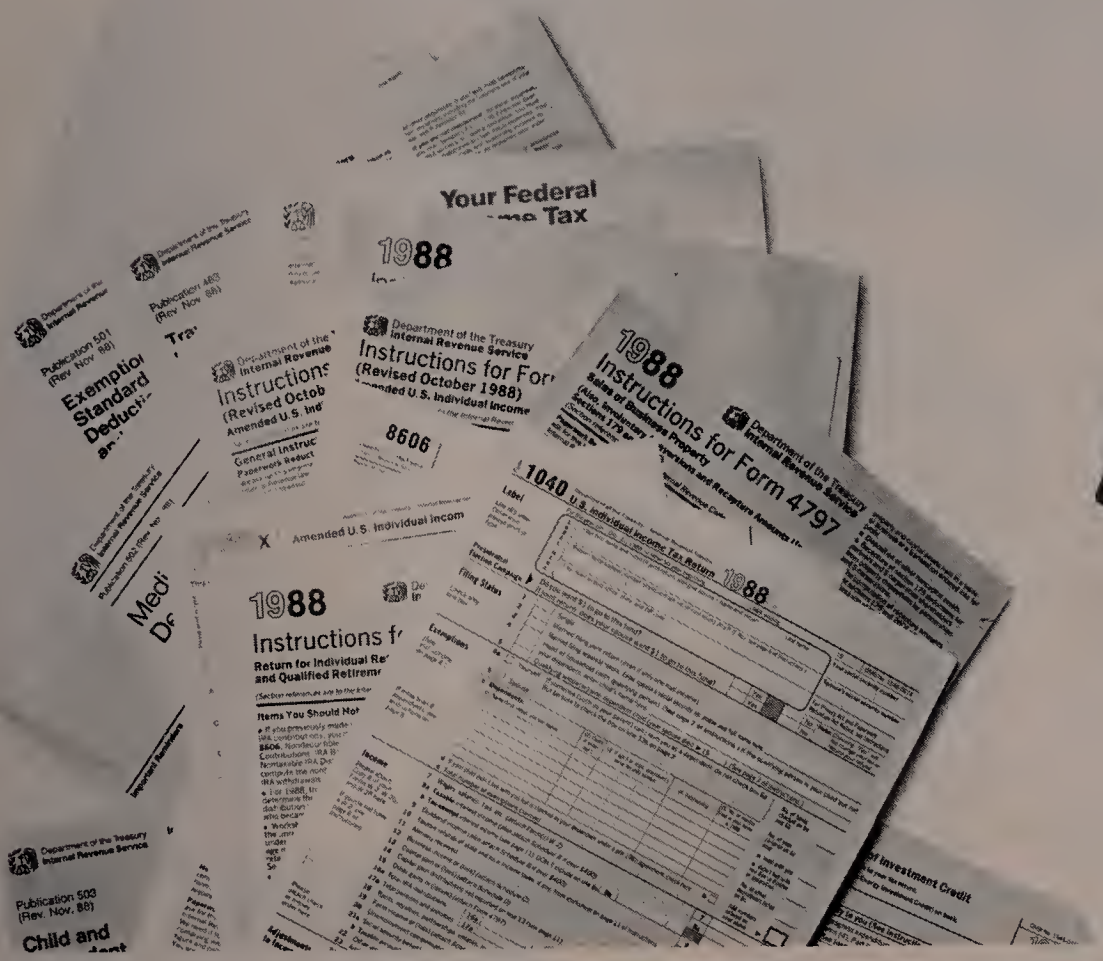

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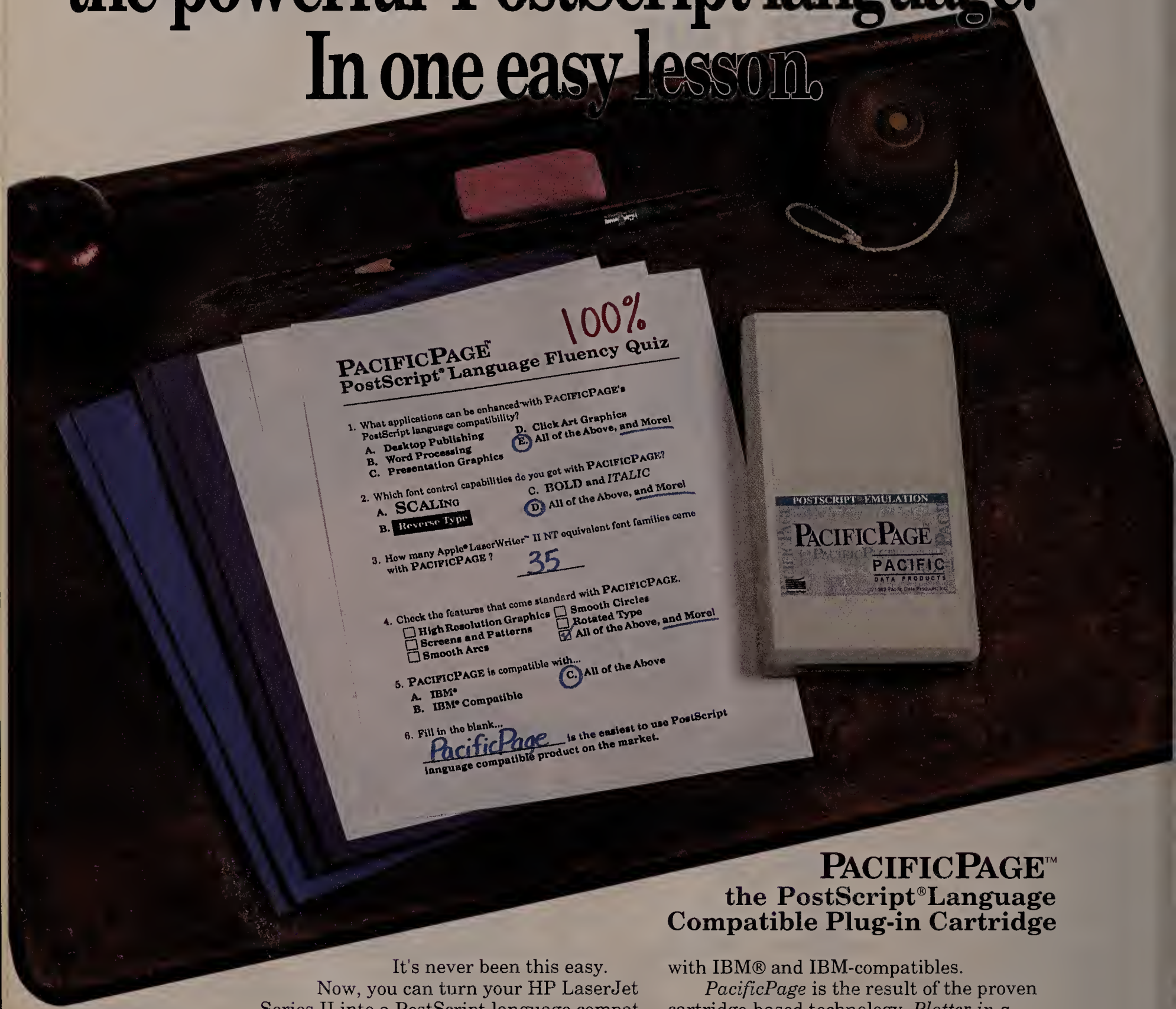

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PhoenixPage

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memory, which requires a third-party board in a Compaq Deskpro 286.

In addition to backing up authorized dealers with technical support staff, Compaq maintains a customer relations department (713/370-0412) to help users work with dealers to solve problems.

John Sweney
Senior Administrator, Media Relations

Editor's note: We think Compaq should include information about memory expansion in its documentation, especially since so many of its own dealers weren't able to help.

Z-Soft Makes a Good Offer

I purchased *PC Presentation* [a Z-Soft utility for creating demos] from a supplier who assured me it would run with *PC Paintbrush*. But I soon discovered that it would not work with *PC Paintbrush for Windows* because a file called Frieze is missing. I wrote to Z-Soft to find out if there was a work-around to this problem, but I received no response.

Michael D. Brown
Tlell, British Columbia

Z-Soft responds: To run *PC Presentation*, it's necessary to own *PC Paintbrush 3.0*, *PC Paintbrush Plus 1.5*, or *Publisher's Paintbrush 1.5*, or later versions. The reason is that *PC Presentation* requires Frieze, a memory-resident graphics subsystem available in these DOS products. *PC Paintbrush for Windows* doesn't use Frieze; instead, it uses the graphics subsystem in *Microsoft Windows*.

For customers who have purchased *PC Presentation* for use with *PC Paintbrush for Windows* and who don't own a compatible Z-Soft product, Z-Soft offers these solutions: We will provide a free copy of *PC Paintbrush 3.77;* or if you prefer, Z-Soft will work with you to arrange a refund for *PC Presentation* from your dealer. *PC Paintbrush for Windows* users can also upgrade to our other products ($35 for *PC Paintbrush IV*, $54 for *PC Paintbrush Plus*, or $185 for *Publisher's Paintbrush*, plus shipping and handling).

Although *PC Presentation* is no longer sold through dealers, it will continue to be available to Z-Soft customers by request. Z-Soft's customer support department is open 9 to 6 at 404/428-0008; the address is 450 Franklin Rd. #100, Marietta, GA 30067.

Mark S. Zachmann
President

A Job Well Done: Iomega

Recently I purchased a used 10MB Bernoulli Box. Unfortunately, the seller had misplaced the owner's manual for the adapter board, which must be installed in the PC to operate the drive. My call to Iomega's support department was one of the most pleasant experiences I've had in computing. The representative took time to explain how to install the card, how to modify CONFIG.SYS and AUTOEXEC.BAT files, and how to maximize performance. Then, without charge, they mailed the board manual I needed, as well as an upgraded ROM chip and an upgrade of the operating software!

The installation was easier than adding a modem. I'd like to salute Iomega for a great product and fantastic support.

James Johnson
Address unavailable

Take action! If you've got a complaint or a compliment, send it to Consumer Watch. *We'll follow up and publish letters with the broadest interest. For more information, see How to Contact PC World, page 4.* ●

POWER TIP NO. 81

No Hang-Ups With SideKick Plus

Sometimes the auto-dialer in *SideKick Plus* displays a disconnect message and hangs up the phone as soon as the party you've called answers. The reason is that the carrier detect switch on your modem conflicts with the setting in *SideKick Plus*. To change *SideKick's* Carrier Control setting, press <F10> and select Communications Parameters Options. At the Options menu, highlight Carrier Control and press <Enter>. Press <Esc> three times to return to the Summary menu, select Options Save Setup, and press <Esc> twice to return to the Phonebook Summary screen. Now *SideKick* won't hang up until you're ready.

George Beinhorn
Nevada City, California

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Micronics 25 MHz and 33 MHz motherboards allow you to maneuver in the 386 fast lane!

Some manufacturers push components and designs to improve performance and reduce their costs. Pushing components, even a little bit, creates the kind of heat and stress that cause systems to crash and data to be lost forever.

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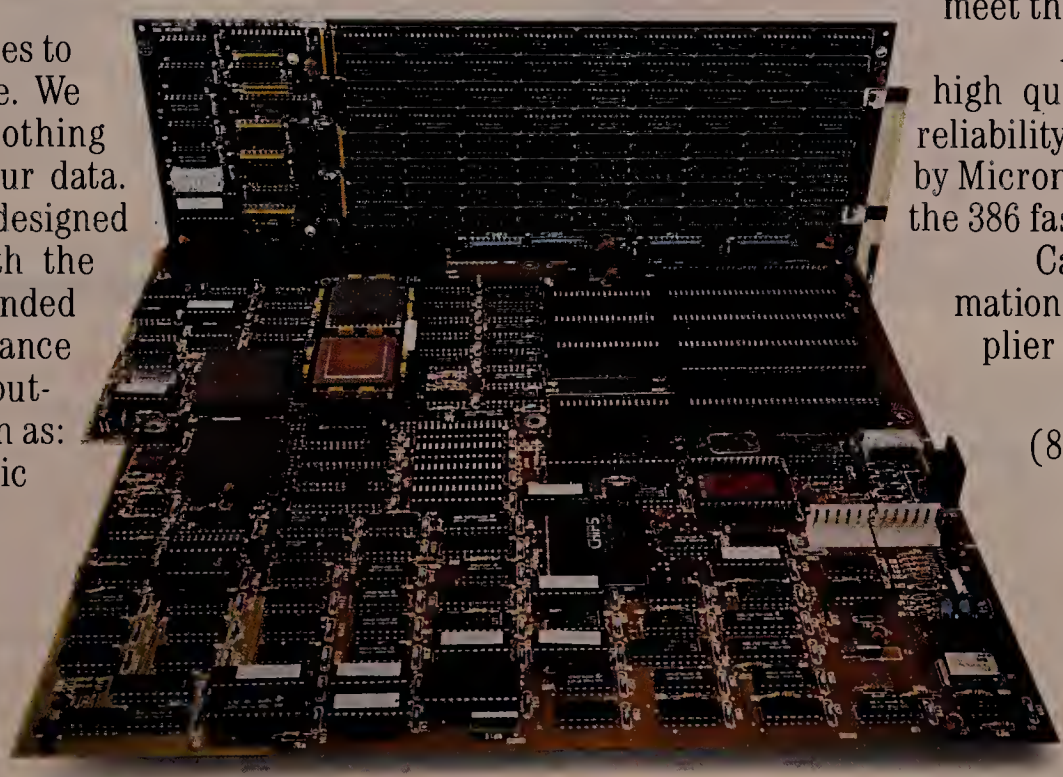

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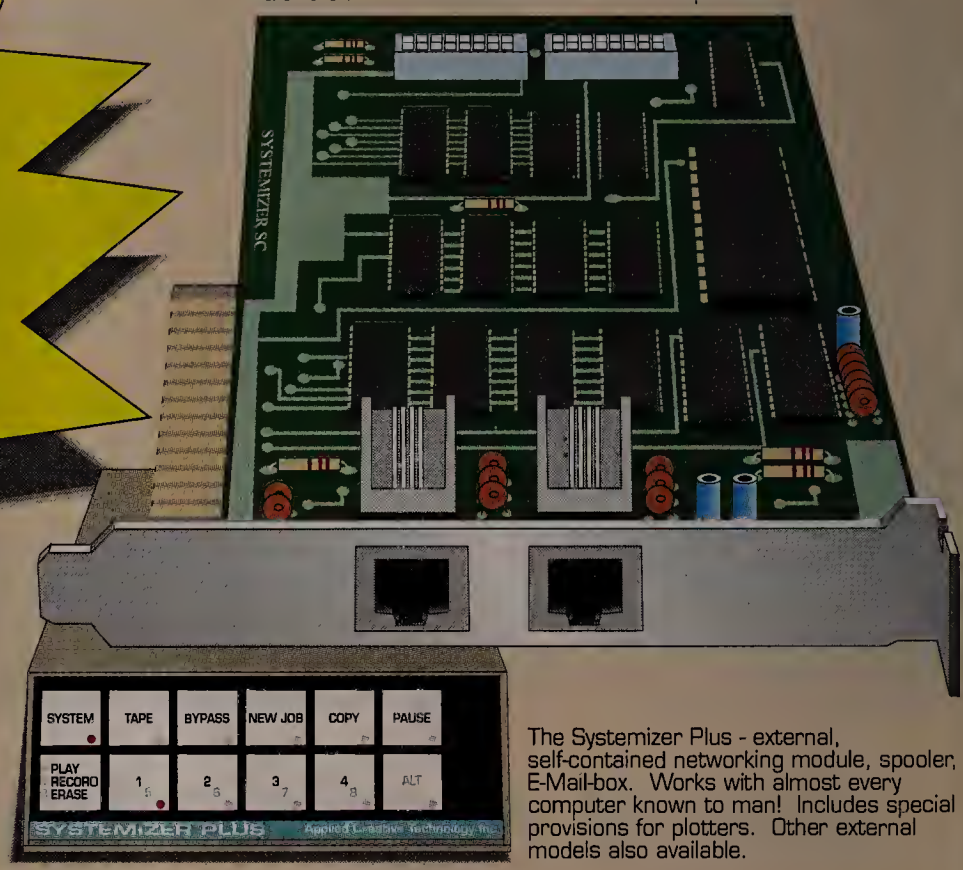

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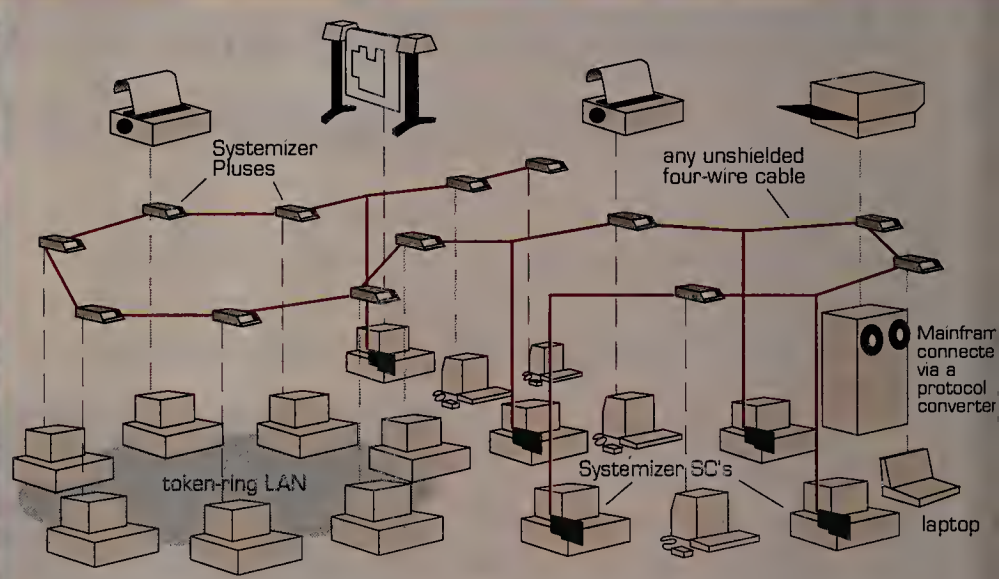

Example: 17 micros, of various brands, *plus* a mainframe, all sharing printers, data and E-Mail via Systemizing. Note how some PC's on a token-ring LAN are also part of the Systemizer LAN.

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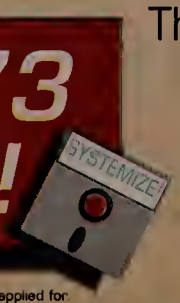

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Circle 77 on reader service card

STAR-DOT-STAR *.*

A global exchange of personal computer discoveries

Import formatted ASCII text with a Microsoft Word macro, control printers from the DOS prompt, capitalize words in dBASE fields, switch to 40 columns for overhead projectors, get up-to-date directories in WordPerfect, exclaim your way from dBASE to DOS, juice up a Pascal power failure, move in fast for a truly reptilian experience, and moon walk through your programming chores.

Edited by Tom Swan

ANTHONY RUSSO

ASCII Imports for Word

I used to dread importing formatted ASCII files into *Microsoft Word* because I had to strip out the hard carriage return at the end of every line. (*Word* places a carriage return only at the end of a paragraph.)

I cured my woes with a macro [see **FIGURE 1**] that strips out unwanted carriage returns by replacing them with spaces—except when two returns appear together. The macro assumes that paragraphs in the original ASCII file are separated by two consecutive returns. Also, the text must not contain the pipe symbol (¦), which the macro temporarily inserts to mark the document's end. If your document contains vertical bars, replace the bar in the macro's first line with some unused character.

Richard F. Laherty
Terre Haute, Indiana

Editor's note: To create the macro, start Word, *and type the macro exactly as shown, including the brackets (< and >) and chevrons (« and »). (Press <Ctrl>-[and <Ctrl>-] to enter the left and right chevrons.) Disregard the line breaks in* **FIGURE 1**, *and type the macro as one long string. Highlight the entire macro and select Copy. Then type ASCII-Converter^ and press <Ctrl>-AC<Enter> to name the macro.*

Select Transfer Glossary Save and press <Enter>. The next time you load an ASCII text file, press <Ctrl>-AC to run the converter.

Featured Printing

PC-Write sometimes leaves my Epson printer stuck in near letter quality (NLQ) mode, and I usually forget to reset the printer to draft mode before printing data base reports and other long documents. PRC.PAS [see **LISTING 1**] saves the day by letting me select printer features from the DOS prompt. Compile the program text to disk with *Turbo Pascal* version 4.0, 5.0, or 5.5. Then copy PRC.EXE to a directory listed in the current PATH command. To switch draft mode output on, type PRC 27 120 0 or place the command in a batch file.

Larry O'Rear
Georgetown, Texas

Editor's note: The values following PRC are the decimal code values that select various printer features. A few useful Epson commands are PRC 27 120 1 (NLQ mode), PRC 15 (condensed mode on), PRC 18 (condensed mode off), and PRC 27 71 (double strike). For other code sequences, check your printer's reference manual.

(continues)

```
<ctrl pgdn>¦<ctrl pgup>
«while selection<>"¦"»
<esc>s^^p<enter><right>
«if selection<>"^p"»
<backspace><space>
«else»<right>
«endif»
«endwhile»
<del>
```

FIGURE 1: This macro converts plain ASCII text to Microsoft Word formatted paragraphs.

A Capital Idea

dBASE III Plus users often enter text in all uppercase or lowercase characters, which looks bad when printed. I wrote CAPS.PRG [see **LISTING 2**] to capitalize the first letter and lowercase the rest of each word entered in a data field. TEST-.PRG [see **LISTING 3**] demonstrates how to use CAPS in your own programs. To run the test, enter and save the listings with your editor, then type **DO TEST** at the dot prompt and enter a test string in the dummy "Company" field.

When CAPS runs, it deletes any leading spaces and converts data stored in the variable *wdlist* (word list) to all lowercase. It also adds two spaces to avoid errors that would otherwise occur if the field were blank or completely filled. Then, it separates and capitalizes each word in the field. The program also translates multiple spaces to single blanks. Finally, the added spaces are removed before returning to the program or procedure that called CAPS.

David Arnold
Saratoga, California

```
program prc;
uses printer;
var i,code,result : integer;
begin
 for i :=1 to paramcount do
  begin
val(paramstr(i),code,result);
   if result = 0 then
    write( lst, chr(code) )
   else begin
  writeln( 'Bad parameter: ',
     paramstr(i) );
    halt( 1 )
  end { else }
 end { for }
end. { prc }
```

LISTING 1: PRC.PAS sends decimal control codes to a printer.

```
parameter wdlst
remwds=lower(ltrim(wdlst))+'  '
wdlst=''
do while len(trim(remwds))<>0
  wd=substr(remwds,1,at(' ',remwds))
  if len(remwds)>0
    remwds=ltrim(substr(remwds,at(' ',remwds)+1))
  endif
  wdlst=wdlst+upper(left(wd,1))+right(wd,len(wd)-1)
enddo
wdlst=trim(wdlst)
return
```

LISTING 2: CAPS.PRG capitalizes words in a dBASE field.

Big Screen Debut

Overhead projectors for PC displays are a godsend, but 80-column-mode characters projected on the silver screen are often too small to be seen clearly from the back of a lecture hall. So I wrote BIGSCRN.BAT:

```
echo off
mode 40
type %1
pause >nul
mode 80
```

Now I can issue the command BIGSCRN *textfile* to switch my display to 40-column mode, TYPE the contents of a plain-ASCII text file, and wait for a key press before resetting the display to 80-column mode.

Paul M. Spannbauer
Delmar, New York

Editor's note: This works only if you have a CGA, EGA, or VGA display. Other possible MODE values besides 40 and 80 are BW40, BW80, CO40, and CO80. You may have to experiment to find the settings that produce the best effect for your display and projector.

Anti Presto

I wanted to add my two cents to "WordPerfect Presto Chango" [*Star-Dot-Star*, September 1989]. I use this handy feature constantly, but it can be confusing for the inexperienced. Pressing <F5> twice displays the previous directory as ordered, but it won't show current information for files created or modified after *WordPerfect* was loaded. To make sure you're seeing a current file list, position the selector on '<CURRENT> <DIR>' and press <Enter> twice. This causes *WordPerfect* to reload the directory from disk.

Mike D. Dedmon
Carlsbad, Texas

Exclamation Pointers

Marcus Jeter's RUNDOS.PRG ["See dBASE Run," *Star-Dot-Star*, April 1989] is useful, but you can also type an exclamation point at *dBASE*'s dot prompt to

(continues)

```
company=space(35)
@ 5,0 say 'Enter company name';
   get company
read
do caps with company
return
```

LISTING 3: TEST.PRG demonstrates CAPS.PRG (LISTING 2).

101 uses for your old dot matrix printer.

No. 68

It's not surprising what people are doing with their old dot matrix printers.

Simply because no comparably priced dot matrix printer can print text and graphics as quickly, as clearly or as quietly as Canon's affordable new BJ-130e Bubble-Jet Printer.

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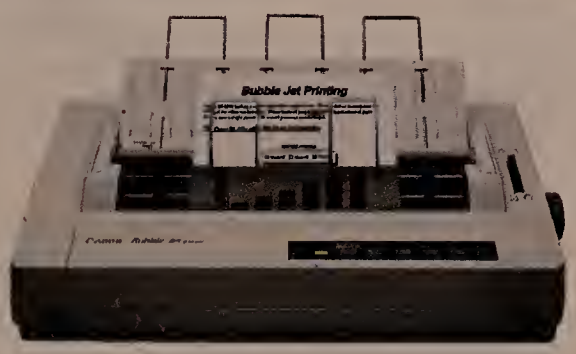

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Bubble-Jet

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Circle 47 on reader service card

issue DOS commands. For example, type ! DIR /W to display a wide directory of all files. (*dBASE*'s own DIR command lists only .DBF files.) After the command executes, DOS returns you immediately to the dot prompt or to a .PRG program. Jeter's RUNDOS.PRG pauses for you to view the display and press <Enter>.

Nancy L. Brodsky
Penn Wynne, Pennsylvania

Power Failure

In "New Math for Turbo Pascal" [*Star-Dot-Star*, August 1989], function power(base, exponent) doesn't work when negative bases are used. For example, writeln(power(-7, 3)) doesn't generate the correct answer, namely, negative 343. I modified the function [see **LISTING 4**] so that it works more like BASIC's exponentiation operator (^), right

(continues)

DEVELOPER'S TOOLBOX

Hi Mom, Hi Pop

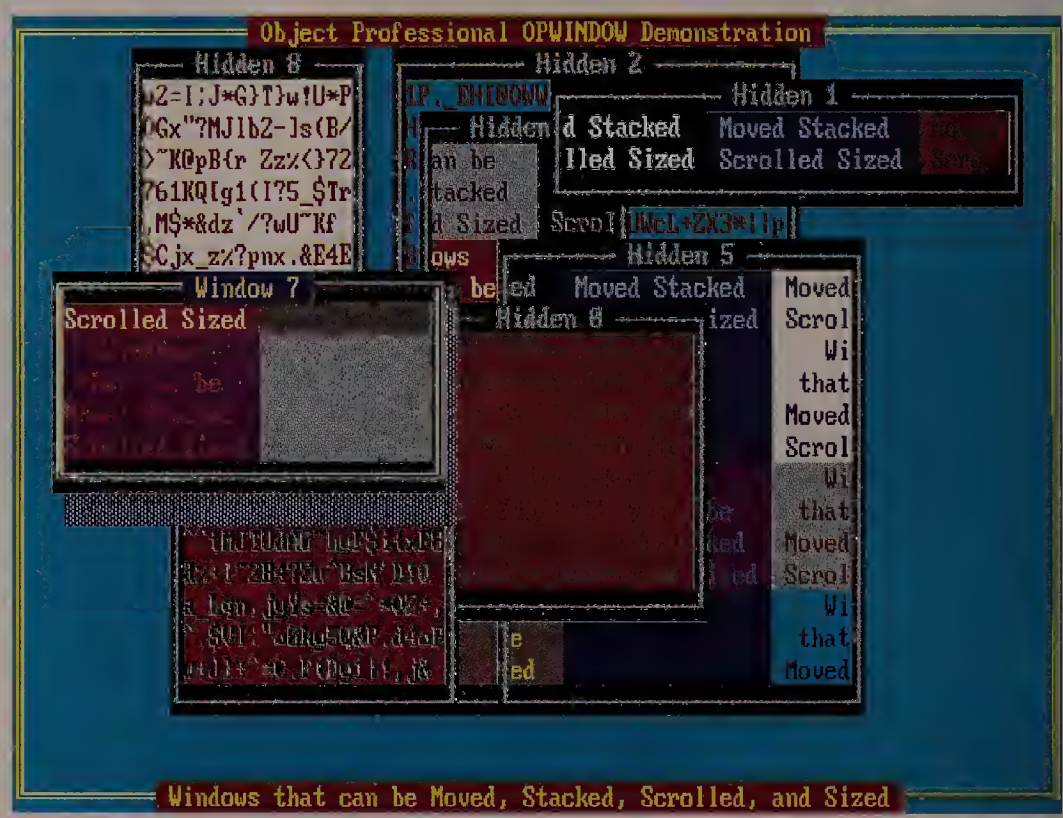
Are the days of mom-and-pop software development ancient history? No. But staking out your claim is far more difficult than it used to be, when the only required investments were a 64K IBM PC, a box of blank disks, and a six-pack of Coca-Cola. Nowadays, running a successful software business, doesn't mean outmaneuvering the Microsofts but overcoming your number one enemy: time.

Or, more precisely, wasted time. Do you find yourself writing the same code over and over? How many wheels have you reinvented lately? And do you spend late nights writing juicy low-level routines rather than concentrating on finishing your application?

If so, you can get a helping hand from Turbo Power's newly revised *Object Professional* for *Turbo Pascal 5.5*. *Object Pro*'s object-oriented tools are superlative in design and boost programming productivity beyond measure.

Programming with *Object Pro* is like walking on the moon—I can bound along effortlessly, encapsulating my code inside a snazzy mouse-driven, windowed interface that would otherwise take months of down-to-earth labor.

A good bit of *Object Pro* is coded in assembly language, a time-tested strategy for boosting performance. In the past, there were two ways for me to achieve similar results: I could insert



Object Professional uses OOP techniques to add multiple overlapping, scrollable windows to Turbo Pascal programs.

INLINE statements in my Pascal programs, or I could use an assembler to create .OBJ files for linking into finished code.

Now I've come across a third way to optimize Pascal programs with assembly language. I simply load the shareware program *TP&Asm*, which runs *Turbo Pascal* and magically adds a full assembler to the compiler. I'm not sure how the trick works, but it's a wonder to behold. Special keywords let me switch at will between assembly language and Pascal. I also have full access to run-time library and OOP extensions, which lets me fine-tune objects with super-fast machine code. These features make *TP&Asm* one of the handiest optimizers I've ever used.

Tools like *Object Pro* and *TP&Asm* add zest to my programming chores, but the *real* fun in running a software company is shipping products out the door. For years, I've used DOS's DISKCOPY command to produce a pile of disks containing the program listings from my books. Now I've found an alternative in *The Duplicator Toolkit*, which stores a compressed master image on a hard drive and then copies it alternately to two floppy drives (5¼ or 3½ inch), in standard or high-density

(continues)

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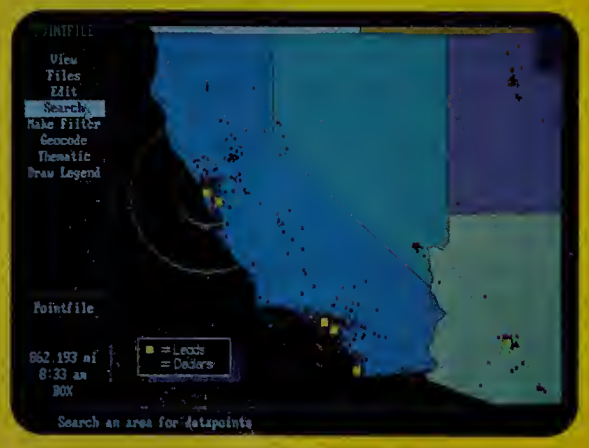

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```
function power( base, exponent : double ) : double;
  function f( b, e : double ) : double;
    begin f := exp( e * ln( b ) ); end;
begin
  if base = 0.0
    then
      if exponent = 0.0
        then power := 1.0
        else
          if exponent < 0.0
            then runError( 207 )   { 0^negative }
            else power := 0.0
    else
      if base > 0.0
        then power := f( base, exponent )
    else
      if frac( exponent ) = 0.0
        then
          if odd( trunc( exponent ) )
            then power := -f( -base, exponent )
            else power :=  f( -base, exponent )
        else runError( 207 )  { negative^noninteger }
end; { power }
```

LISTING 4: This modified Pascal power function correctly handles negative and positive bases and exponents.

DEVELOPER'S TOOLBOX

(continued)

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I welcome your comments. My MCI Mail handle is TSWAN; my CompuServe ID is 73627,3241. —*Tom Swan*

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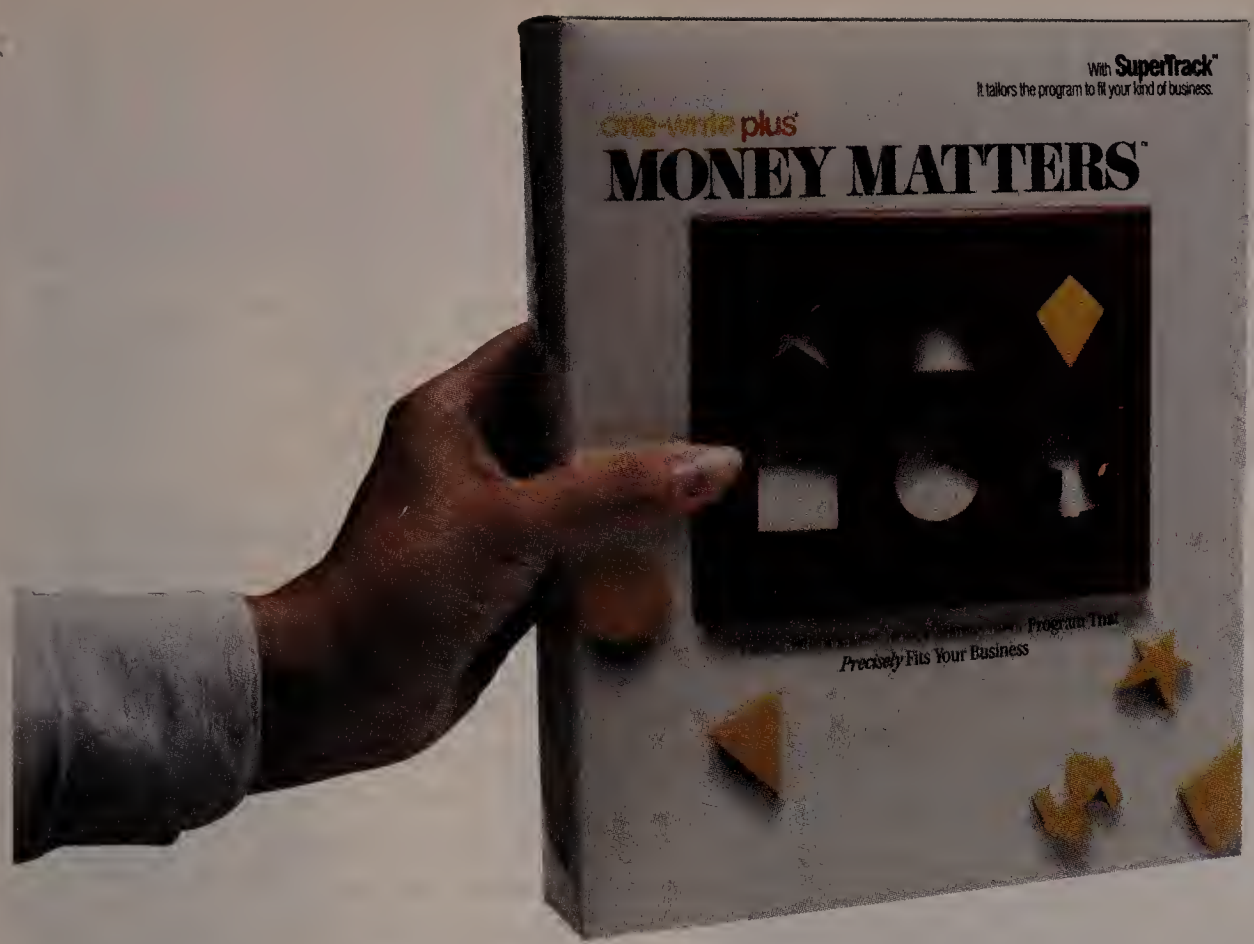

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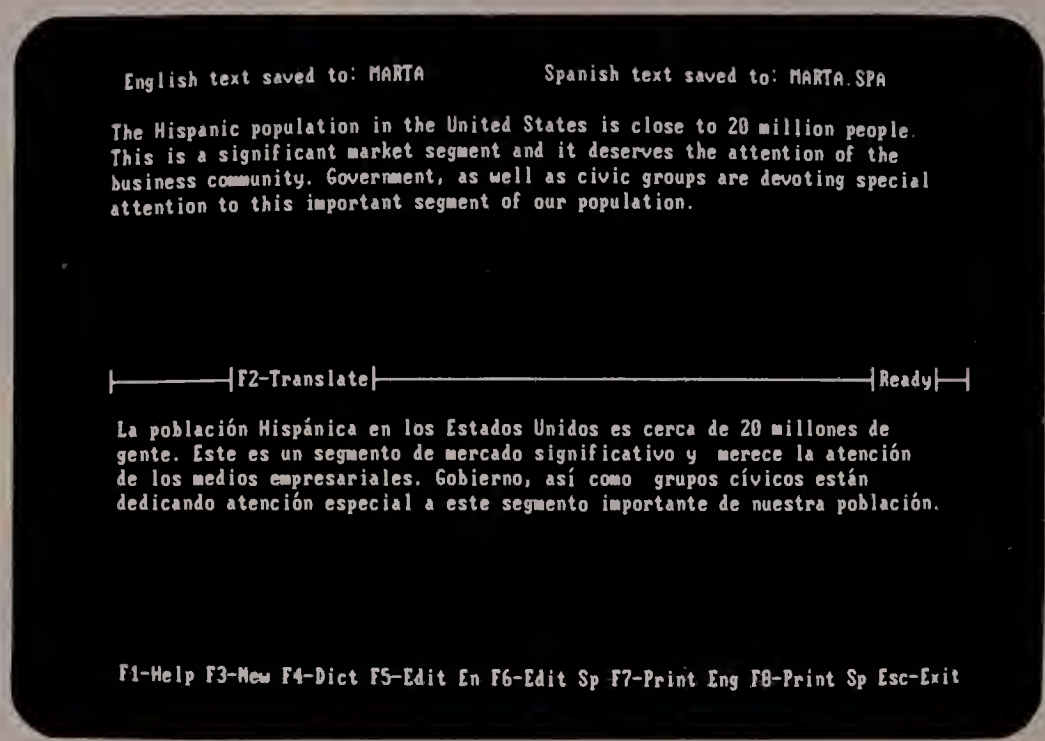

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down to generating a run-time error when attempting to raise 0 to a negative power or raise a negative base to a noninteger (fractional) power.

John Lawrence
Kenai, Alaska

Editor's note: To use the function with Turbo Pascal 5.0 *and* 5.5, *insert the directive {$N+,E+} at the top of your program to enable math coprocessor or emulation data types. For version 4.0, use {$N+} if you have a coprocessor, or change the function's extended variable types to real if you don't. Also change the two 'runError (207)' commands to 'ln(base)' to generate the run-time errors.*

Attention Lounge Lizards

I discovered a tip for fans of Sierra On-Line's *Leisure Suit Larry in the Land of the Lounge Lizards.* To play this adults-only adventure game, you have to answer a series of questions to confirm your age. But there's an easy way to skip these prompts: Just press <Ctrl>-<Alt>-X to go directly to lizard land.

Jerry Torres
Ponce, Puerto Rico

Tom Swan is a contributing editor for PC World *and the author of* Mastering Turbo Pascal 5.5 *(Howard W. Sams and Co., Indianapolis, 1989).*

Share your tips and discoveries with PC World *readers; see How to Contact PC World, page 4.* ●

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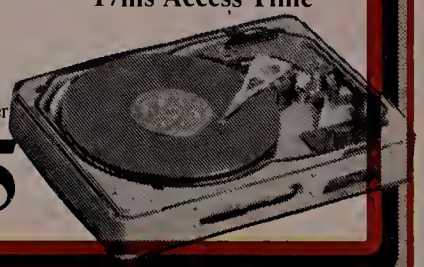

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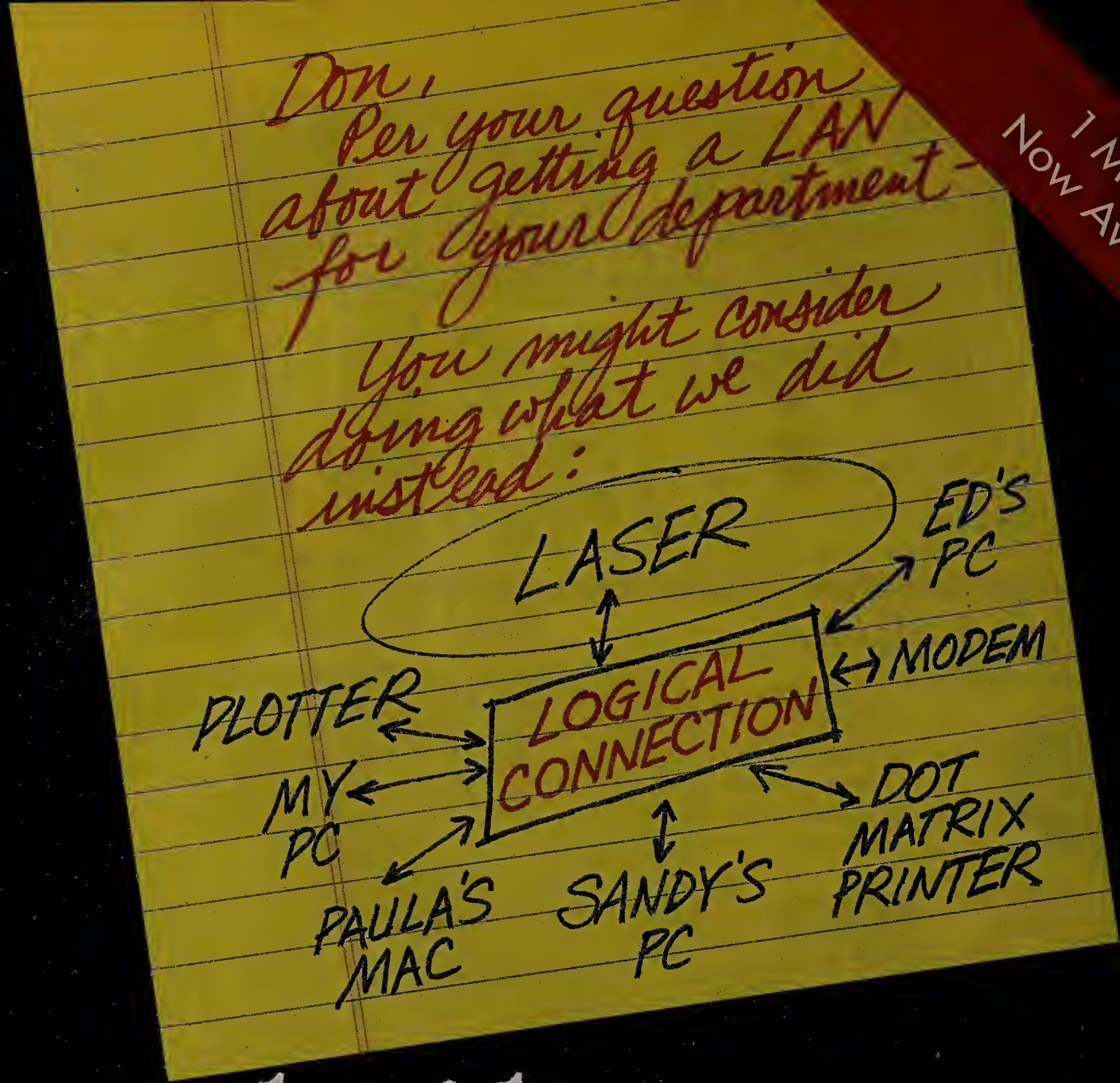

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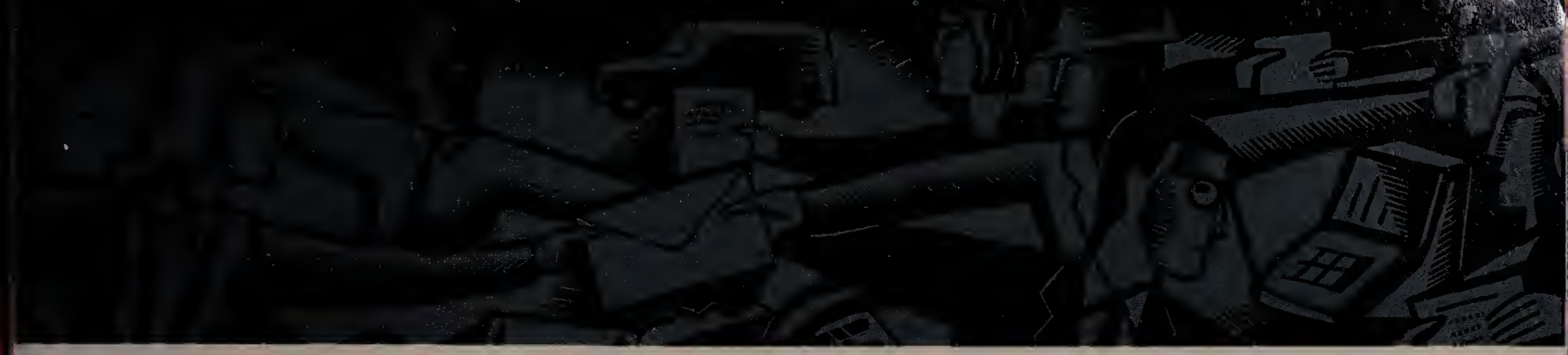

NETWORK Q&A

Tips and strategies for departmental networking

3270 gateways can link your LAN to a mainframe for far less than a traditional terminal controller.

David Ferris

Q. *We want to link our* NetWare *LAN of 32 PCs to a remote IBM mainframe. We don't require full-time mainframe access, but most of us need to log on occasionally. We also want to be able to hot key between mainframe and PC applications. Should we buy an IBM 3174 controller or a 3270 LAN gateway? What are the cost and performance differences? If we go for a gateway, what features should we look for?*

John Miller
Wausau, Wisconsin

A. Until fairly recently, PC users who wanted to emulate 3270-series terminals for remote access to an IBM mainframe had few choices. They simply installed a terminal controller recommended by MIS and linked their PCs directly to the controller with coaxial cable. Each PC was equipped with a terminal emulation board—such as an IRMA—and ran emulation software to access mainframe sessions.

A terminal controller is a specialized computer, usually an IBM 3174 or an older 3274 unit, that channels 3270 terminal requests and incoming mainframe sessions. It links up with the mainframe's front end processor (FEP) via modem, or directly with coaxial or twisted-pair cable. The FEP, usually an IBM 3705 or 3725 computer, acts as the mainframe's communications intermediary.

For LAN users, a 3270 gateway is usually a better choice for accessing both local and remote mainframes. In place of the controller, you set up a dedicated PC on the LAN with a gateway board and software and a high-speed synchronous modem. The gateway emulates the controller, connecting with the FEP as usual. PCs on the LAN can tap into the mainframe merely by running 3270 emulation software—no IRMA boards or coaxial cable is needed.

Gateways Versus Controllers

The main benefit of a gateway is its low price. The gateway itself

(continues)

TABLE 1

3270 Gateways—A Clear Bargain

For a network with 32 PCs (or any number of workstations), 3270 gateways are much cheaper than terminal controller setups, even if you add in the cost of the LAN.

Components	Controller setup	Gateway setup	Gateway plus new LAN
Coax boards	$32,000		
3174 controller	$15,000		
Synchronous modems	$2000	$2000	$2000
Cables and installation	$8000	$250	$8250
Gateway PC		$1500	$1500
Gateway board, software		$5000	$5000
Adapter cards		$400	$13,200
LAN OS			$4000
Server			$4000
Totals	$57,000	$9150	$37,950

ANTHONY RUSSO

costs about half the price of a controller, and the big savings come from not having to pay for emulation boards and extra cabling. For your 32-PC LAN, you would pay about $9000 for a gateway setup instead of $57,000 for a controller setup. You save even when you factor in the cost of the LAN (see **TABLE 1**).

Cost isn't the only advantage. With a gateway you save a slot in each PC and avoid cabling hassles. Gateways are also more expandable. Controllers usually include 16 or 32 ports, with each port representing a single logical unit (LU), or session. If you need more ports, hold on to your wallet—you may have to shell out for a new controller. Depending on the configuration, a gateway accommodates 16, 32, 64, or 128 sessions, and you can upgrade via software for much less.

A gateway's major drawback is slower performance. Even with light traffic, remote response time is often twice that of a controller—instead of waiting a second for a screen to refresh, you wait two. This is acceptable for casual use but annoying for full-time data entry.

Whether you go with a gateway or a controller, setup and maintenance are a challenge. Both require knowledge of 3270 terminals, SNA programming, SDLC communications, and other minutiae. You'll spend a lot of time matching pacing values and other settings on the FEP and gateway.

Usually, MIS will install and maintain a 3174 controller, but if you go with a gateway, much of the burden falls on the LAN administrator. Make sure you have plenty of training and support, and test the gateway thoroughly before bringing users on line.

Which Gateway to Buy

About thirty 3270 gateways are available from vendors such as Attachmate, DCA, IBM, ICOT, Novell, and Rabbit. No one vendor is the clear market leader, and each has particular strengths. For example, IBM supports token ring links, Novell offers many terminal modes, ICOT uses less RAM, and Rabbit is known for its slick user interfaces.

To whittle down your options, consider the following issues. Chances are, only a few products will meet your needs.

3270 Terminal Type First, make sure the gateway supports the terminals you need to emulate. All gateways mimic monochrome 3278 terminals, and many emulate 3279 and 3179 color displays. However, not all gateways support all specific terminal types and mainframe graphics modes—such as all-points-addressable (APA) vector graphics or S3G graphics.

Controller Emulation Make sure the gateway emulates your controller type and supports your transmission medium. If you plan to link your gateway directly via token ring, check that it supports the Token-Ring Interface Coupler (TIC), which is located on the FEP. If you plan to make a remote link, the gateway will probably use SDLC communications, but you may need BSC compatibility. Also, make sure the gateway supports your line type (dial-up, leased line, or X.25 packet network) and the appropriate line speeds.

If your department has a spare 3174 controller but you've not yet invested in coax boards and cabling, you can put the 3174 between the gateway and the mainframe to speed communications and minimize setup and maintenance hassles. If you take this tack, make sure your gateway emulates the specific controller model. Find out if it supports the single-session CUT (control unit terminal) mode or the DFT (distributed function terminal) mode, which splits a line into 5 concurrent sessions. The controller may have a 3299 multiplexing port, which splits a line into 40 sessions. Keep in mind, however, that most gateways provide more multiple concurrent sessions when used without a controller.

Printer Support Do you need to output to a specific type of IBM 3270 printer? If so, does the gateway let your standard PC printers emulate these models?

APIs and Transfer Protocols

If you've written custom PC-to-mainframe programs using an application program interface, make sure the gateway supports your API. Most gateways support IBM's HLLAPI, but few allow APIs such as APPC/LU 6.2. Also, determine if the gateway is compatible with mainframe file transfer programs such as IBM's IND$FILE.

Security and Administration

Mainframe applications often demand security precautions that a particular gateway doesn't support. For example, to generate payroll checks, a user may have to work at a specific terminal.

Also, find out if your company uses IBM's *NetView*, a program that lets MIS technicians re-

(continues)

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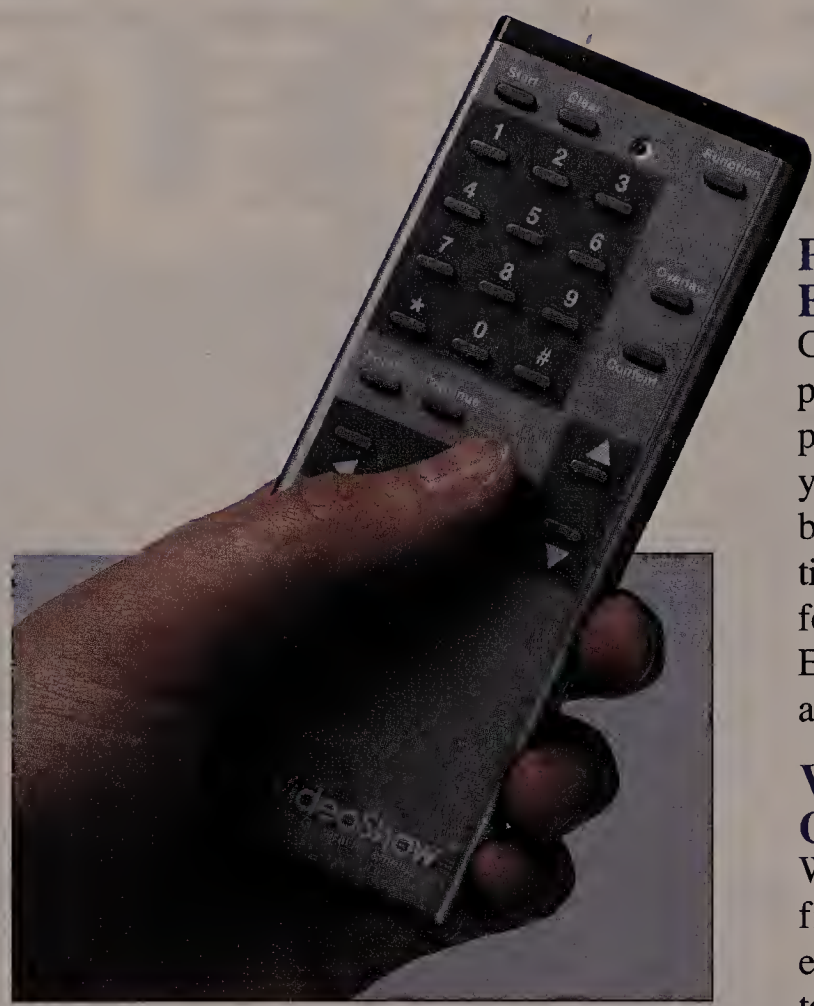

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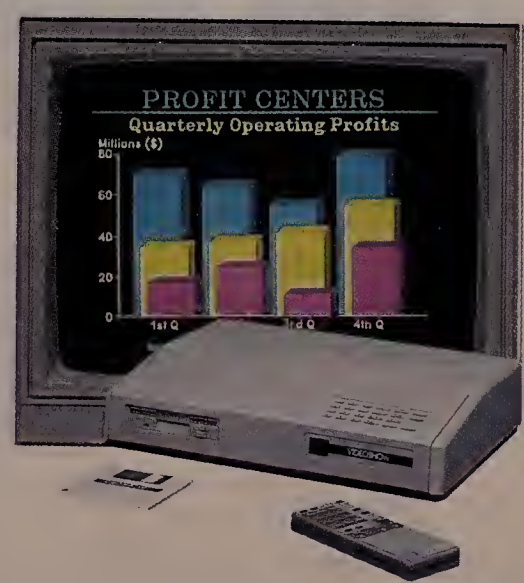

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motely monitor and adjust communications snags over an SNA network. Not all gateways support it.

RAM Cram On a LAN workstation, about 110K is eaten up by DOS, CONFIG.SYS drivers, the network shell, and NETBIOS, leaving only 530K for applications—and that's without TSRs. A typical mainframe session requires about 125K, leaving about 405K, and some emulations consume more. The result: You won't have enough RAM to hot key to large PC applications.

If RAM cram is a problem, try the Ksaver gateway from ICOT of Natick, Massachusetts. It requires only 40K per session, leaving 490K free. To gain further RAM, you can use LAN Systems' *LANSpace* utility, which shoves the network shell and NETBIOS out of main memory, freeing up 50K to 60K.

Hot-Key Options Hot-key skills vary greatly. Most gateways let you switch from a mainframe session to DOS so you can run a PC program. Some permit background PC-to-mainframe file transfers while you run a DOS application; others let you split the screen and cut and paste data between mainframe and PC sessions.

Performance Gateway performance varies. Some vendors attempt to boost speed by off-loading processing from the gateway PC to the gateway board. Using such a coprocessor means you can get by with an 80286 as a gateway instead of having to use an 80386. If traffic is light, you may even be able to use the system for other tasks. Other boards depend on the gateway PC's CPU, and some can take advantage of fast 386 PCs. Neither approach is inherently faster.

Screen response time and transfer speed depend primarily on the transmission medium between the gateway and the FEP. A token ring link is usually fastest, running at 4 mbps, while remote dial-up links normally run at 9600 bps.

Gateways Take Over

If your LAN requires full-time mainframe access, speedy controllers may be your best bet. However, gateways are getting faster, and the gap is closing. For

(continues)

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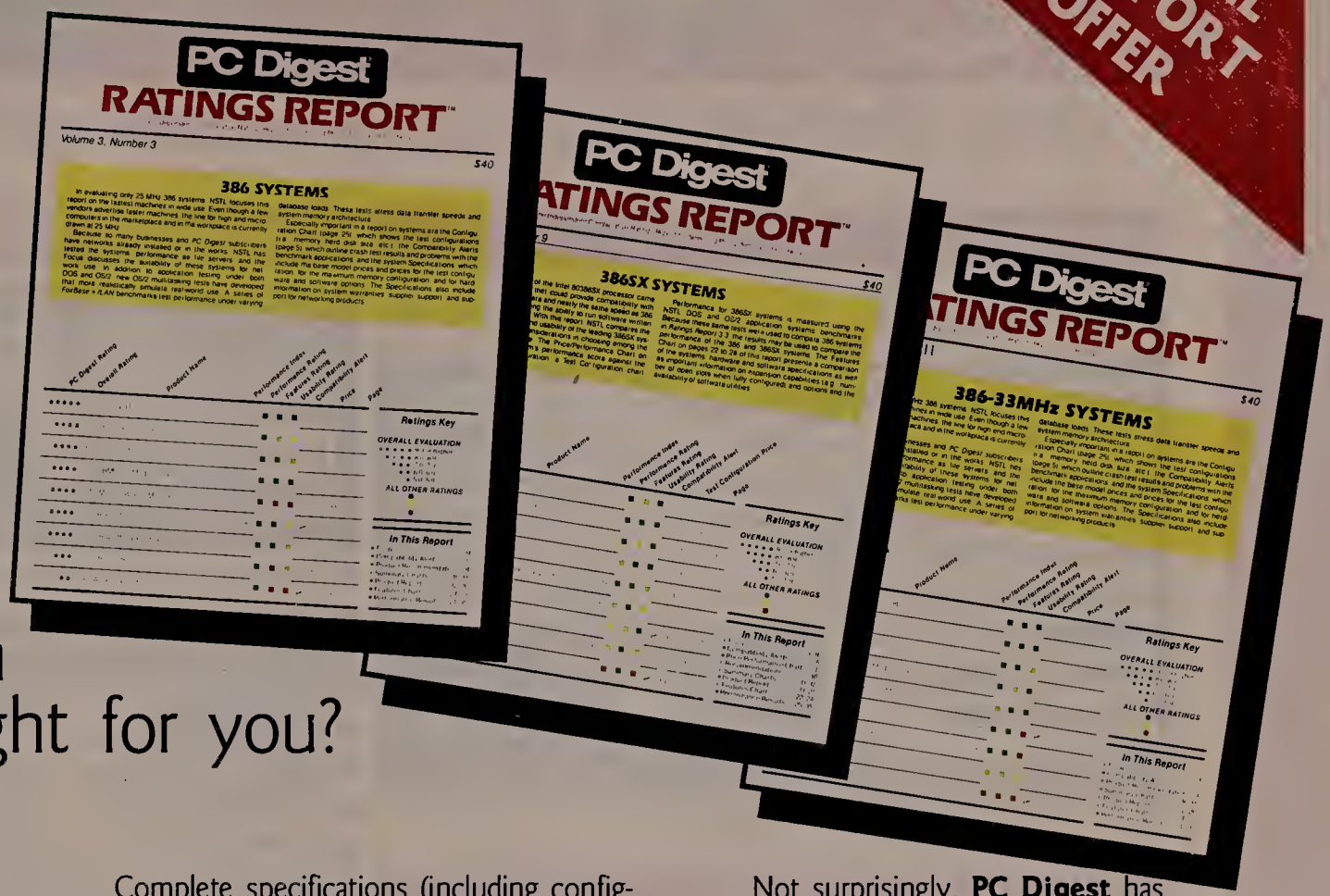

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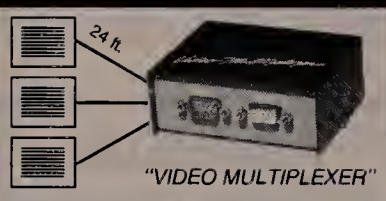

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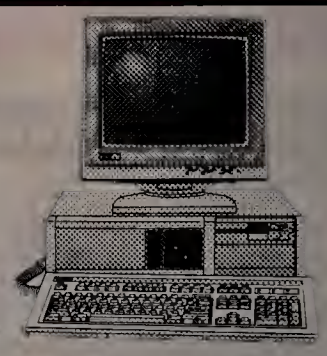

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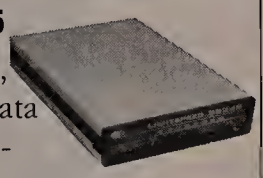

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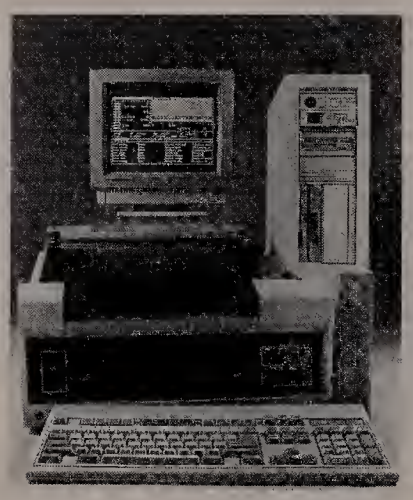

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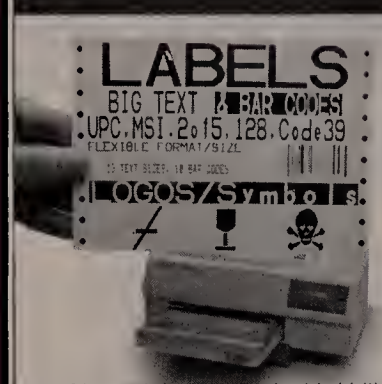

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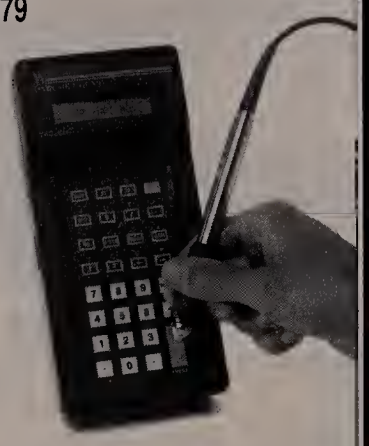

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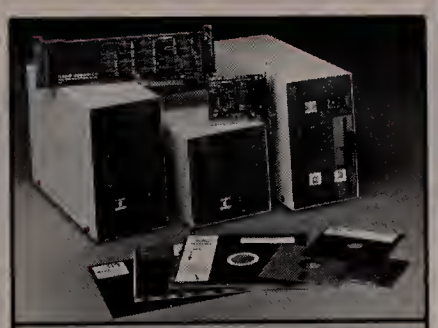

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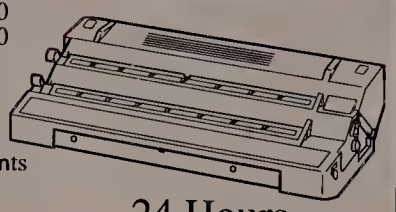

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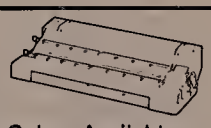

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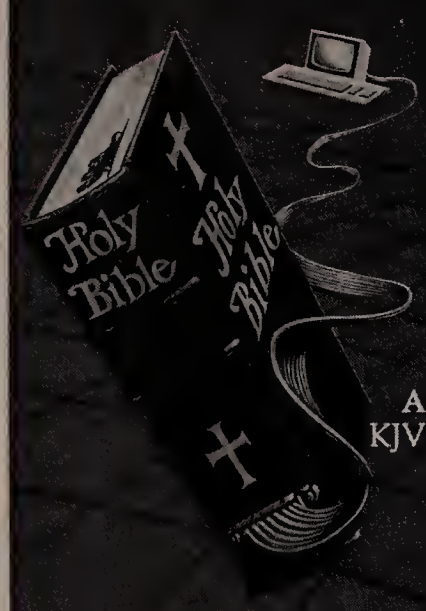

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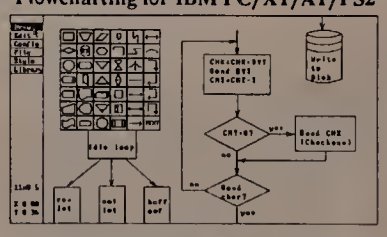

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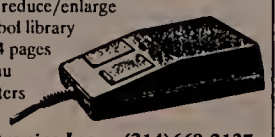

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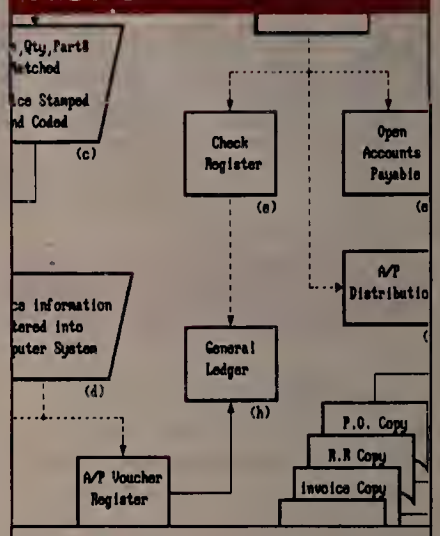

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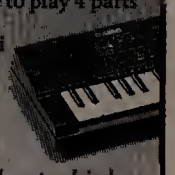

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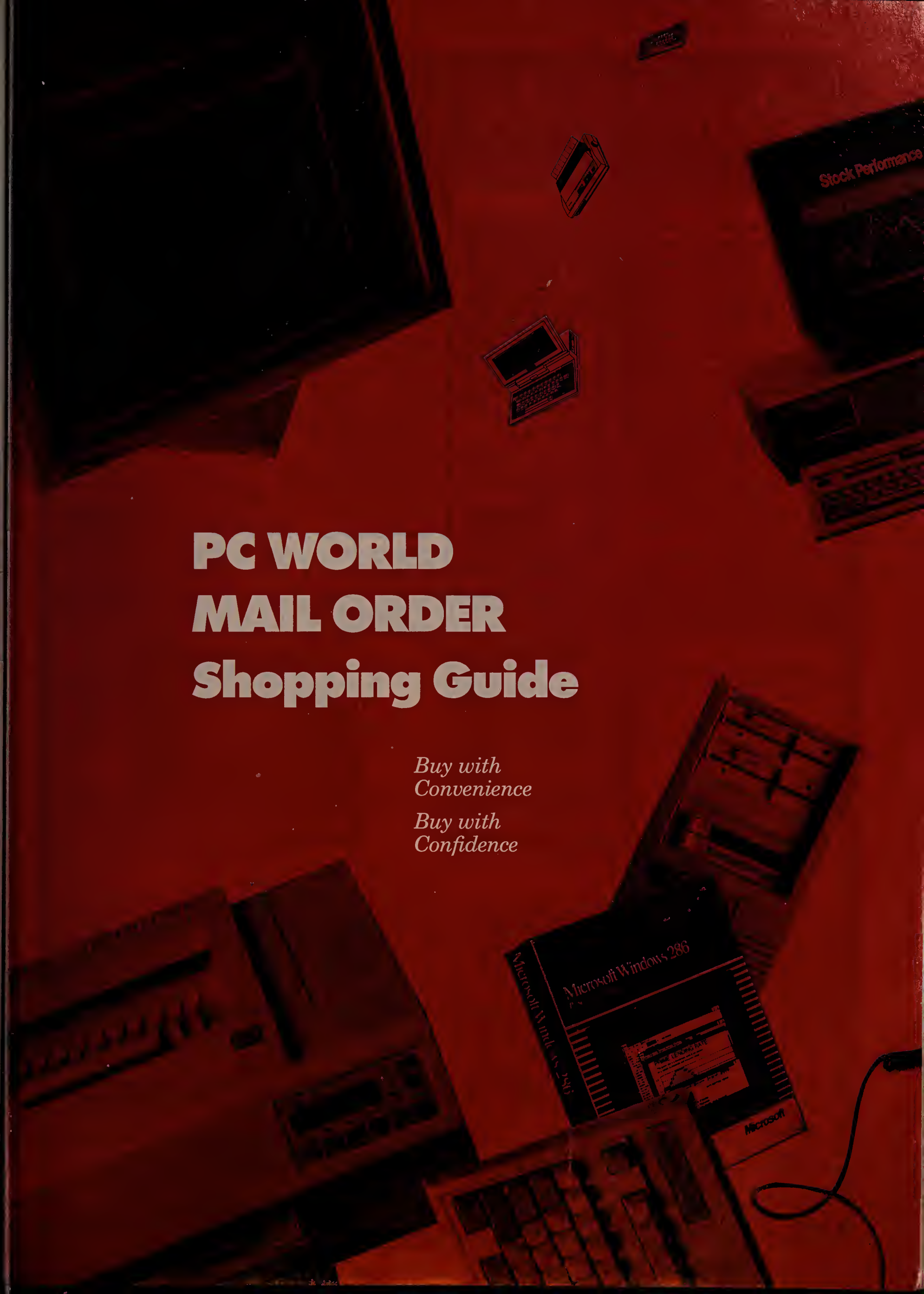

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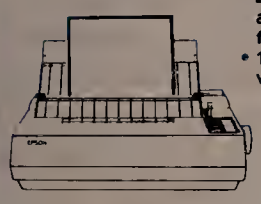

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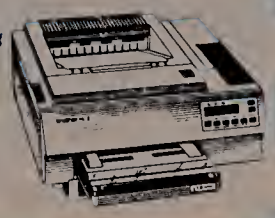

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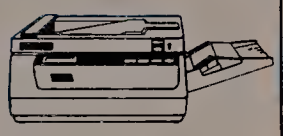
905



FEATURES:
- 6 pages per minute
- HP Series II emulation
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- 6 resident fonts
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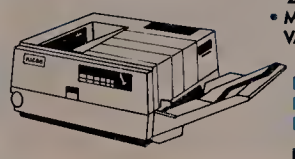

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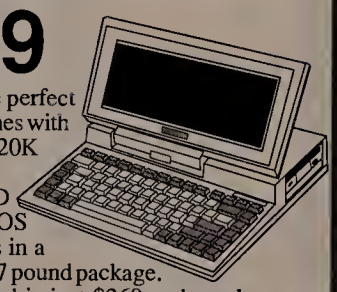

The T1000 is the perfect second PC! It comes with 512K of Ram, a 720K floppy drive, a supertwist LCD screen and MS-DOS in ROM! All this in a battery-powered 7 pound package. A 768K Ram card is just $269 and can be set as base, expanded, or a non-volitile Ram disk.

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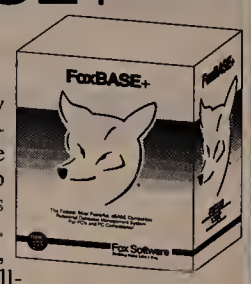

FoxBase+ 2.10 is simply the fastest dBASE compatible database software available. FoxBase+ also adds many enhancements to the dBASE language. And it's user-friendly too, its FoxCentral uses pull-down and pop-up menus and you can perform every important database operation without programming! There are even LAN, runtime, and 386 versions available.

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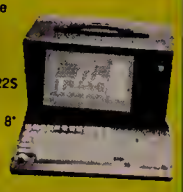

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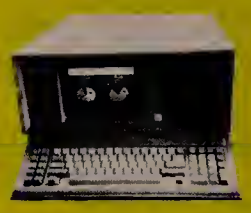

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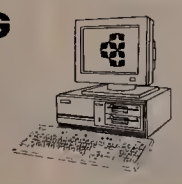

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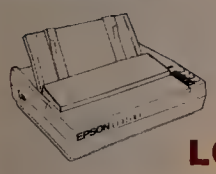

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- "Shadow" and "Qutline" Print
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- Cut-Sheet Feeder
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LQ-950

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- 6K Buffer
- SmartPark Paper Handling

Options

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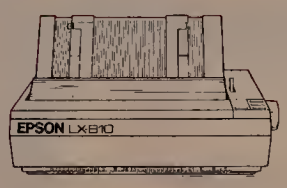
- 32K Buffer



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- Friction and Tractor Feed
- Automatic Single-Sheet Loading
- IBM ProPrinter Character Set

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- Front Panel Controls

Options

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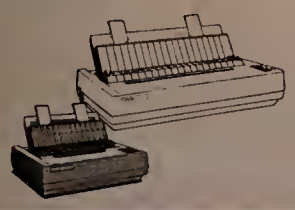

LQ-1050/LQ-850

- 264 CPS in Draft Mode
- 88 CPS in Near Letter Quality Mode
- 6K Buffer
- SmartPark Paper Handling
- Front Panel Controls

Options

- Tractor Feed; Cut-Sheet Feeder
- 32K Buffer

LQ-2550

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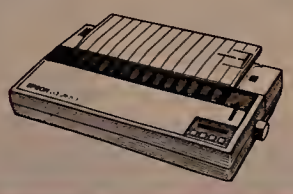

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LQ-950	EPS-7767
FX-850	EPS-8750
FX-1050	EPS-8755
EX-Series Black	EPS-8763
EX-Series Color	EPS-8764
DFX-5000	EPS-8766
LX-80 / LX-86	EPS-8762L
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LQ-1050 / FX-1050	EPS-7312-A
LQ-950	EPS-7313-A
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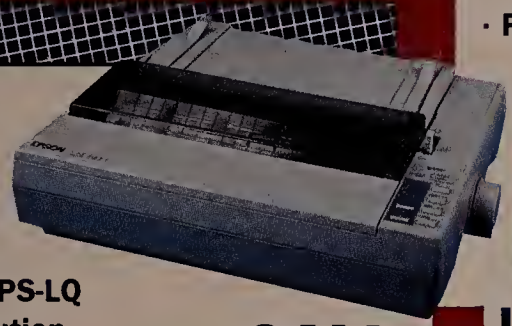

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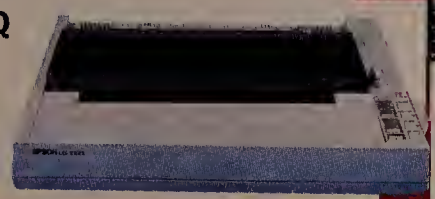

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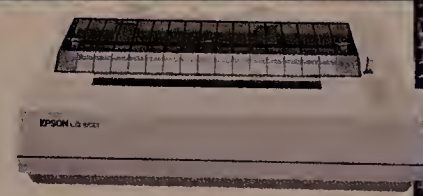

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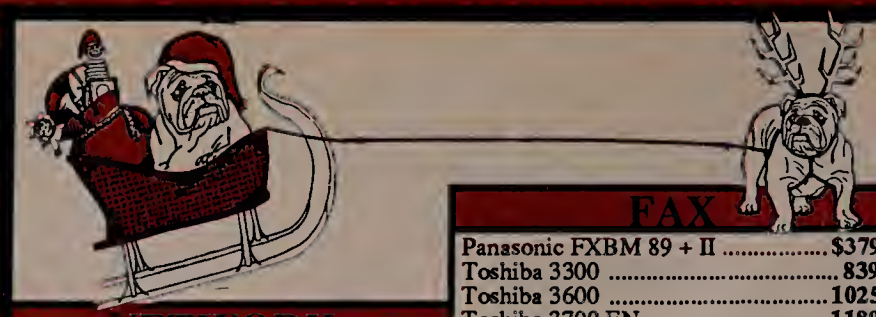

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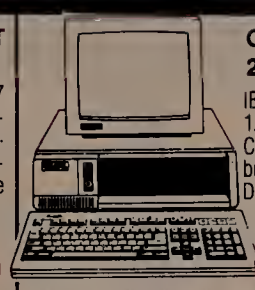

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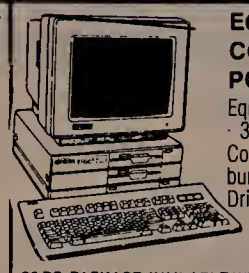

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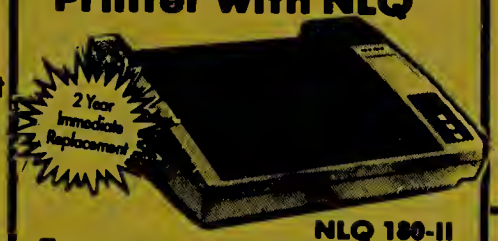

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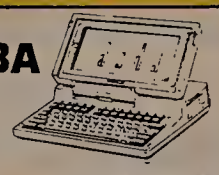

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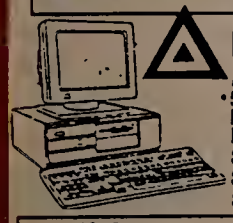

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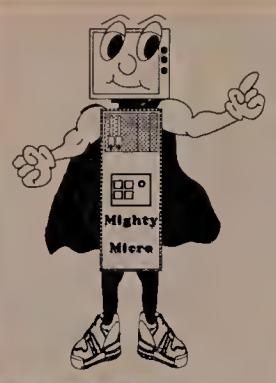

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- Compaq SLT w/40 mb 4350

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- Model 50-30/60 ..... 2499/2739
- Model 55 SX 30/60 ..... 2829/3119
- Model 70 Portable 60/120 ..... 5589/6029
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- Model 80 - 40/70 ..... 4579/4875
- Model 80 - 300 8899

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- Toshiba 1200F 1395
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- Genoa 5400 259
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- Orchid Pro Designer w/256K 229
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- Pacific Rim ext 1.2 IBM 30/286 209
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What User Support?

Paul Clay

In this day of consumerism, how many of us would pay hard-earned dollars for a brand-new TV, refrigerator, or PC without a warranty or the right to use the product as we see fit? But when we "buy" software, we think nothing of paying hundreds or even thousands of dollars for a product that we're actually renting "as is."

Not only do we not own the software on our desks, but those licensing agreements that we breezed past when we tore open the packages spell out a restrictive set of precepts concerning copies, and use on multiple machines. Even a cursory examination of the typical license reveals an amazingly one-sided agreement that gives the software publisher product ownership and the legal high ground and leaves users with few, if any, rights.

To cap it off, publishers have discovered another way to make money—charging customers extra for the privilege of learning how to use their products. And I'm not talking about just a few bucks.

Premium support for Ashton-Tate's *dBASE IV* or Computer Associates' *SuperCalc V* costs $150 a year. Sometimes support costs more than the original software. For instance, Novell's fee for a year's unlimited telephone support for *Btrieve* runs $500—more than twice the $245 street price of the single-user version.

That high price is especially distressing because some *Btrieve* problems that caused me grief have reportedly been fixed in a recent version. So after paying hundreds of dollars for a product without warranty that we don't own and can't use the way we need to, we must pay for an upgrade to get the workarounds for its bugs.

Most large software publishers do offer some kind of initial free support, but that usually lasts just long enough to get you past the installation and shakedown. It seems that when you actually start to rely on the thing or try something a little out of the ordinary, you find that the free support period has expired. In many cases, long-distance telephone support numbers aren't toll free, and support staff are often less than expert in their assigned areas.

Of course, there *are* stars out there. WordPerfect Corporation, for example, provides great support for its sundry products. Help is always free, and you can get in touch quickly using one of the toll-free numbers for the different products. Better still, the technical staffers have always been competent and helpful, and the company has made frequent free revisions to its software to fix bugs or add some small feature. Too bad more companies don't follow this example.

As customers, we can reward companies like WordPerfect that provide good products and service, by giving them our business. And we can avoid buying from companies that make promises they don't keep, provide little or low-quality support, or offer inferior products. ●

Paul Clay is an OS/2 and LAN special interest group leader for the Chicago Computer Society.

Have a different perspective? Write Dan Lavin, User Ombudsman, PC World, *501 Second St., San Francisco, CA 94107.*

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